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A REPORT OF TWENTY-SEVEN CASES OF CHRONIC PROGRESSIVE CHOREA.¹

By ARTHUR S. HAMILTON, M. D., MINNEAPOLIS, MINN.,

*Instructor in Pathology of the Nervous System, Medical Department,
University of Minnesota.*

In the following paper, I desire to consider some cases of chronic chorea which I have had the opportunity to study during the last nine years. Ten were personally observed during a seven years' service in a state hospital; ten were taken from the early records of the same institution and, of these, the histories are, unfortunately, very meagre; three were relatives of some of the above patients and were seen in their homes. The remaining four were studied in private practice.

CASE No. I.—Male, age 84, married, laborer.

Clinical History.—Little known as to the patient and practically nothing as to his family. He was born in New York State and is a blacksmith. Nothing is known as to his wife or children. From 1895 until his admission at Independence he was an inmate of the Clinton County Poor Farm. During this time he was insane and probably had been so for many years

¹ Read in abstract at the meeting of the Chicago Neurological Society, Oct. 25, 1906. Of the series of cases here reported, ten (Cases I, II, III, IV, V, VI, VII, IX, XII, XXI) are taken from the records of the State hospital for the insane at Independence, Iowa; ten (Cases VIII, X, XI, XIII, XIV, XV, XVI, XVII, XVIII, XIX), also from that institution, were personally observed during my service there, and for the records of the former group and for many facts in relation to the latter group, I desire here to make acknowledgment to the other physicians connected with that institution; three (Cases XXII, XXIII, XXIV) were studied in their homes at various points in Iowa; two (Cases XX, XXVI) were seen in the service of Dr. W. A. Jones, and one (XXVII) in the service of Dr. A. B. Cates. For much of the history of Case XXV, I am indebted to Dr. H. A. Tomlinson, superintendent of the St. Peter State Hospital.

before. He had the reputation of being a troublesome and dangerous man, the most of his life, and for many years past his neighbors have feared him. As one expressed it, "He has been a mighty mean man." He was generally suspected of numerous petty crimes in his neighborhood, but never convicted of any of them. While at the poor farm he claimed to have been the inventor of a well-boring machine and was determined to prosecute everyone who had a bored well as having infringed on his patent. No argument in this connection had any effect upon him. He insisted that his patent would never expire and that the prosecution of the infringements would immediately make him a multi-millionaire. He also believed that he could cure all forms of disease, including insanity, with kerosene, and if he could in any way find an opportunity he would pour kerosene on the heads of the insane men about him and immediately claim that they were cured. It is said that when he was young, he was a giant in strength, and the steward of the poor farm states that, with the exception of his legs, he had retained this strength to a remarkable degree to within a short time of his commitment to the hospital. He was accustomed to walk about with the assistance of two canes and when an "ugly spell" came on he would throw himself on his back and lay about him right and left with both canes. The steward thought his mental condition had deteriorated quite rapidly of late and said he had become quite filthy.

He was admitted to the State Hospital March 10, 1904. At the time his temperature was 100, but nine hours later it had fallen to 97.2, and continued there up to shortly before his death. He was cross and irritable and did not want any one to assist him in any way. At the same time he could not walk unless firmly supported by the arms and even then his feet dragged. He was constantly in bed. There were well-marked choreiform movements of the right upper extremity, including the shoulder; also of the head, particularly the mouth, eyelids, and eyes. There were moderate movements in the abdomen and right leg and foot, and very slight movements in the left arm and leg. Articulation was much impaired. At first he swallowed readily, but at the last with much difficulty. He appeared to understand questions quite well, but was exceedingly irritable in answering, and would even get angry with himself for his helplessness. Control of the bowels and bladder was much impaired. In the daytime he was usually restless, and at night he slept only fairly. He died at 8 a. m., March 17. One and one-half hours before, his temperature had been 102.4 and respiration 36. At admission his urine examination was as follows: Clear; yellow; acid; Sp. g., 1025; no sugar; trace of albumin; numerous hyaline casts and some granular casts; a few pus cells and many calcium oxalate crystals.

CASE NO. II.—Male, age 53, married, farmer.

Family History.—Nothing known of his antecedents except that his parents were natives of Germany, as was also the patient. He has four children, not yet fully grown.

Personal History and Present Illness.—In earlier life the patient is said to have been addicted to the excessive use of liquor. His present trouble has existed for many years and of late has been practically stationary. No attempt at suicide and no disposition to filthy or destructive habits, but he has been violent toward his wife.

Clinical Record.—Admitted to the hospital in December, 1891. There is no record of any physical or mental examination. He was thought to be in good general health, but had well marked choreiform movements involving practically his entire body. He ate and slept well and was quiet and well behaved. Had no delusions. After 15 months he was discharged and re-admitted three years later. There had been little progress in his physical ailment, but there was a history of several intervening acute outbreaks of mental disturbance, and an increasing tendency to be violent. A few days previous to this admission he had threatened to burn some houses and barns and to kill several individuals, and had carried a club about with him. No attempt at suicide.

Remained subsequently in the hospital up to his death, four years later. During the first three years his history was quite uneventful. His general health was good, and he was quiet and inoffensive, though at times depressed. A variety of treatment was tried without benefit. During this time he passed through an attack of typhoid fever, but there is no record of this influencing his mental or physical condition. During the last year of his life, his failure was much more rapid, and his movements became so marked that he could, only with difficulty, walk even short distances, and at times he would even fall out of bed. He finally died with marked symptoms of respiratory distress, but without gross pulmonary lesions. He is also said to have been paralyzed and unconscious for three days previous to his death.

CASE No. III.—Female, age 55, married.

Clinical Record.—Almost no history of the patient. She was the wife of a farmer, but had no children. Nothing known as to her parents. Her chorea had existed since she was 43 years of age, and at the time of her admission to the hospital was severe, though otherwise she was in good general health, and ate and slept well. At times she was unruly. Six months after admission she died of "exhaustion."

CASE No. IV.—Female, age 57, married.

Clinical Record.—History very meager. Patient was born in Vermont and is the mother of 12 children whose present condition is not known. A sister and a brother are affected in a similar manner. Nothing known as to the antecedents. Ten or more years ago symptoms of the patient's present condition were first noted. Since then her trouble gradually progressed until she became demented and filthy. No suicidal or homicidal tendency. When admitted, her choreiform movements were general and very violent, so that she had to be fed with a spoon, and could walk only

with the greatest difficulty. She was very much demented. Death occurred two months after her admission, but the cause is not stated.

CASE No. V.—Female, age 51, married.

Family History.—The father and mother were English people, who died in advanced age of unknown cause. The father had no nervous or mental disorder, but the mother had moderate choreiform movements. A sister had a similar disorder and was insane. A brother died of tuberculosis at 43. Other brothers and sisters are thought to be well. Patient, also born in England, had six children. One died in infancy very suddenly and two at six and eight years, respectively, of scarlet fever. There are also three grandchildren, of whom two are well, and one is "very nervous."

Present Illness.—Choreiform movements observed since patient was 36 years old, said to have come on as a result of weakness following childbirth. When admitted to the State hospital, October 22, 1880, she was demented and occasionally violent. Had a disposition to hide things, would break dishes and soil and tear her clothing and bedding. No record of any examination except that she was in fair physical health, and had marked choreiform movements so that she walked with difficulty and at times fell. Two months after admission she died of dysentery. The movements continued to the end.

CASE No. VI.—Female, age 25, single.

Family History.—As given in Case No. VII.

Personal History.—Normal in childhood, except for mumps, measles, whooping cough and la grippe; the latter of which was very severe. No history of severe injury. Went to school until about 16, and did as well as her brothers and sisters. Exact time and manner in which her mental and physical ailments appeared is uncertain, but the symptoms, if present at all, were certainly not marked until shortly before her admission to the hospital in February, 1897. Two months previously had had a fever of some sort from which she seemed to fully recover in a few days, but one week later her movements and, a little later, her mental symptoms appeared. Movements began in her hands and were severe from the outset. The mental disturbance began with incoherency. She frequently imagined she was talking with some one, but her speech was altogether disconnected. There was no tendency to injure others, to suicide, or to filthy or destructive habits. When admitted to the hospital she seemed stupid, though apparently conscious of her surroundings. She frequently made unintelligible noises, but did not speak. Is said to have had marked choreiform movements, but no detailed statement is given. Reflexes of both upper and lower extremities increased, well marked ankle clonus on both sides. Pupils responded to light. About this time she developed a fever of 102 to 105 with a weak pulse of 112 to 125. Occasionally vomited and her hands and feet were quite cyanotic. The least disturbance brought on a marked attack of the choreiform movements. Urine examination showed nothing,

except a trace of albumin. From this acute illness, she gradually recovered, but her choreic condition continued, and she lived for three years, ultimately dying of pulmonary tuberculosis. There is no careful note of her condition during this time, but she is known to have been extremely demented, rarely spoke, and paid no attention to any one or anything. The dementia was the most noticeable feature in her case, but the irregular movements were present throughout the body to the end.

CASE No. VII.—Male, age 45, married, farmer.

Family History.—Father's history very uncertain. He is thought to have died of old age and not to have had chorea. Mother died of this disorder. They had nine children, some of whom died of pulmonary tuberculosis and of dropsy. Three of the sons had chorea.

Personal History.—Patient, born in Canada, was healthy in childhood. No rheumatism, venereal disease or alcoholism. In adult life fairly healthy except occasional sick headaches. No severe injury. In school did as well as the average. Was married at 22 and has had five children, of whom one died of typhoid fever, and one from accident. Others ordinarily strong and healthy. Two have continued so, have married, and have borne children who are normal. The remaining child (the third in order of birth) developed chorea, and is Case No. VI.

Choreiform movements were first noticed at 35 years of age. The face and extremities were first affected, but later the entire body was involved, no one part more than another. At about 40 his disposition changed, and he became cross and sullen. He gradually grew worse, imagined that every one was trying to injure him, frequently abused his family, and finally attempted to kill his wife. Shortly after the latter action was sent to the State hospital. Was then in good general health, not suicidal or destructive in his tendencies, but very stubborn, fault-finding and discontented. Thought the medicine given him made him worse, was unreasonable about going to meals and changing his clothes, and made a great deal of trouble. At night he would often pound on the floor of his room and call for help, but when spoken to usually had a trivial, fancied grievance to complain of. Choreiform movements were very marked throughout his body. He is said to have told of a large number of relatives afflicted like himself, but at the time of making this record I am unable to find anything concerning them except as above. Soon after admission to the hospital he began to fail both mentally and physically and, after five months, died of a septic infection of the finger.

CASE No. VIII.—Male, age 50, married, merchant.

Family History.—The father, a native of Ireland, was a hard-working farmer who amassed considerable property. He was always considered queer, and, particularly in his later life, would never speak unless spoken to, and was cross and depressed much of the time. At 80 years of age committed suicide. The history as to whether he had chorea is not satis-

factory. The mother, also a native of Ireland, died many years ago. Nothing known as to her condition. They had three sons and one daughter. The oldest son has had mild choreiform movements for three years; is unsocial, but not regarded as insane. He is married and has no children. The next son is the present patient. The youngest son has not been heard of for years. The daughter is Case No. IX.

Personal History.—In childhood the patient was normal mentally and physically, but secured a limited education on account of having to work very hard. His habits were good. Drank considerably for a short period when about 35 years old. No history of syphilis or gonorrhœa. Was married at 32 and has had two boys. One is an excellent student, but quiet and reserved. The other is strong, rugged, and a good worker, but has little liking for books. Neither is choreic. The patient was never severely injured, and has never had a severe illness except typhoid fever at 35, since when he has never been quite right mentally.

Present Illness.—Two years after the attack of typhoid a little movement of his feet and hands appeared. He would sit cross-legged and keep one of his legs in almost constant motion and twirl his fingers. The movement grew worse and gradually spread to arms and shoulders. Mental power also declined. Was first admitted to the State hospital in May, 1896. Mental disturbance had been quite noticeable for one year and was increasing. He was listless and would lie all day in a kind of stupor unless spoken to. At the same time would worry about not having any work to do. Suicide mentioned, but not attempted. No tendency to vicious, filthy, or destructive habits. When examined he was found to be well developed and well nourished. Height, 5 feet, 8 inches. Weight, 141 pounds. Pulse, 60; regular and moderately full and strong. Muscles firm and skin healthy. Ate well but slept poorly. Choreic movements present throughout the entire body. Urine examination negative, except for high specific gravity. He was fully conscious of his surroundings, and said he came to the hospital to be treated for his "nervousness," which he thought had been present not more than one year. He had felt badly because his condition had kept him from working. Six months afterwards was discharged as "improved," but was shortly returned because he had been cross to his wife and family. At this time the patient stated that his father had had "fainting spells," and that he also had similar attacks occasionally. When they appeared he would fall down unless he had something to hold to. There is no record of these attacks occurring while the patient was at the hospital, and I could learn nothing of them from his friends. He was a quiet and orderly patient at the hospital, giving no trouble, and two years after his first admission he was discharged and remained absent for five years. During the greater part of this time he was cared for by friends. In November, 1903, he was re-admitted. He had grown quite irritable and at times talked to himself in a rambling way. For the preceding month he had been filthy, but previous to that he had

been very tidy. For some time had had trouble in swallowing and recently had failed very rapidly. For three days previously his face had been much more affected than previously. His third admission to the State Hospital was Nov. 12, 1903. A few days before he had fallen out of bed and lain on the bare floor for some time afterwards. The numerous ulcers on his body, mentioned in the physical examination, were produced at this time by his constant moving on the floor.

Physical Examination.—The patient is a medium-sized male, fairly well developed but greatly emaciated; height, 5 feet, 8 inches; weight, 150 pounds; temperature, 100.8; pulse, 80. His face is covered with a grizzly beard and moustache, and there is a moderately heavy growth of hair over the body. Eyes blue, vision good. The forehead is rather low and not very broad. The eyes are very deep set, and there are very dark lines underneath them. Ears normal in appearance and hearing good.

The skin is not very healthy anywhere, and there are numerous superficial ulcers at different points over the body. These are especially prominent over the hips, sacrum, and around the knees and ankles. Feet and hands well formed; ridges of the tibiae smooth. Muscles small and flabby.

As nearly as can be determined the area of heart dulness is normal. Radial pulse fairly strong; radial arteries considerably thickened. Chest moderately well developed. The lungs are normal as far as it is possible to determine their condition. The respiratory movement of the chest is very jerky and much modified by the general movements. Abdominal and genito-urinary organs normal.

The choreiform movements are very striking. The muscles of the face are in almost constant motion, particularly those of the lower jaw. His entire head also moves constantly to the widest possible degree, sometimes laterally and sometimes antero-posteriorly. The hands, arms, shoulders, chest, and abdomen move freely, but the lower extremities are but little affected.

Mental Condition.—He is quite unable to speak, but he seems to understand what is said to him and answers by giving affirmative or negative grunts in such a way as to be understood. As far as can be determined in this way he is fully oriented as to place and surroundings and recalls his previous detention at the hospital. One of his former attendants he is also able to recognize. After being put to bed he soiled the sheet, and this occurred again in the course of the day. He eats fairly well, but it is necessary to have the nurse feed him, since he cannot get the articles of food to his mouth with his own hands.

November 19, 1903.—Has failed gradually since admission and died to-day. The ulcers have increased in size, and he has grown weaker daily. His temperature has ranged from 97 to 101.6, pulse 56 to 98. So far as observed, his movements have not entirely ceased, even in sleep, but he has not slept soundly.

CASE NO. IX.—Female, single, age 22.

Family History.—See Case No. VIII.

Personal History.—Her mother died when the patient was young, and she has always worked hard, borne considerable responsibility and has been much of the time alone at home. Has always had a violent temper. Education fair.

Present Illness.—Was admitted to the State hospital in June, 1882. For two years previously had been unsocial, despondent, and suspicious of others, so that she had alienated all her friends and neighbors. Two weeks before admission complained that the neighbors were putting spots on her eyes so that she could not see to work; thought herself bewitched and that she was being slandered. One week later attacked a man without cause and subsequently was greatly excited; thought she had been both in heaven and hell, and had returned. When admitted she was stubborn and surly, and would not eat or take medicine until forced to do so to avoid the use of a stomach tube. Would not enter into conversation except to frequently demand to be set free. Was very careless in personal matters, frequently tried to escape and twice attacked the attendants. Later she improved a little, became quiet and occasionally would talk pleasantly, but most of the time was unsocial and had several attacks of acute mental disturbance. By December she had improved considerably, except that she was still indisposed to associate with others, but in the February following became much worse. She remained at the hospital for three years, much of the time quiet, but at times loud and vulgar in speech and vicious in her habits. There is no record of any choreiform manifestations during this time. In 1895 she was removed to the local County Poor Farm where she remained until 1896 when she was returned to the State hospital. She was then much demented and was still solitary in her habits and ordinarily quiet, but at times she was much excited, talked a great deal and was profane and vicious. At this time she had well-marked choreiform movements in her face and head. Not much is known of her since, except that she was still living in 1904.

CASE NO. X.—Female, age 87, married.

Family History.—Father died at 95 of old age, had been insane for 10 years. The mother was insane, following the birth of her last child. It is said that neither had chorea, but the history as to this point is insufficient. They had two sons and four daughters. One daughter is the present patient. The other children are all dead. There is practically no history concerning them, except that one son was choreic, and the others were "nervous." So far as known there were no other cases of mental or nervous trouble in the family, including the patient's children and grandchildren.

Personal History.—Was born in New York State, is married, and the mother of eight children. Had a good common school education.

Present Illness.—The choreiform movements were first noticed when about 35, and two years after a severe attack of scarlet fever. As she grew older her movements grew worse, and particularly so during and after the menopause. Mental symptoms are said to have been first observed at 60 years of age. She became afraid that some one would hurt or kill her, and was particularly in fear that she would be hurt by snakes. Ran away from home at times. In earlier life her disposition had been kind and charitable. She was admitted to the State hospital in 1888, and was then 71 years of age. There is very little history of her condition at this time, but she was a quiet, inoffensive patient who made no disturbance, and was as strong physically and, in many ways, as strong mentally as could be expected at her age. In the course of years she became weaker physically and was at times irritable and quarrelsome. Her choreic movements were quite marked. The following examination was made in 1904.

Physical Examination.—An emaciated old woman. Tissues of face much atrophied and teeth absent. Mouth sunken. Complexion sallow. Hair gray and thin. Eyes deeply sunken. Cornea of right slightly hazy. Vision probably fair. Ears normal. Hearing fair. Forehead rather low; otherwise head and face negative.

Skin wrinkled and rather dry. Muscles very small and flabby. Strength fair in proportion to her age and nutrition.

The heart and lungs cannot be accurately examined on account of her voluntary resistance and involuntary movements. No abnormal sounds heard. Heart dulness probably about normal. Radial arteries thickened and somewhat nodular.

Pupils equal. Reaction to light uncertain but probably slight. All the muscles are kept in a state of such tension that it is impossible to examine any of the deep reflexes satisfactorily. The patellar are certainly present in at least a slight degree. She has slight trouble in articulation, but none in swallowing. The tongue is protruded straight without much trouble, and shows some choreic movement.

There is a constant, marked movement of practically the entire body. It is quick and jerky, certainly much quicker than is ordinarily seen in chronic progressive chorea. She attempts to write, but is wholly unable to do so. The movements appear to grow worse in the attempt, but, in general, purposeful movements seem to somewhat restrain the involuntary movement. Both sides of the body are equally affected. There is no abnormal movement of the eyeballs. She shows fair coordination in her hands in helping to dress herself, but the fingers are held almost constantly in semi-contraction and there is also slight tendency to flexion of the toes and inversion of the left foot.

Mental Condition.—She is a tall, thin, frail, old woman, with a nervous, somewhat worried expression. Dress neat. She sits usually with knees crossed and hands folded in her lap. Does not talk much, but occasionally becomes irritable, and then is more loquacious. At times talks to herself in a low tone. When spoken to she answers jerkily and often in an irrele-

vant and would-be-smart way. Enunciation is not very distinct, partly on account of the low tone in which she speaks. She often seems to forget she is talking to some one and relapses into muttering soliloquy of which but few words can be made out. When the physician tried to make a physical examination for purposes of study, she became exceedingly suspicious and resisted everything; at times scolding, and again, even while resisting, she would laugh in a petulant sort of way as if half ashamed that she should be objecting to so simple a procedure. She seemed specially afraid of the stethoscope, but when assured it would not hurt her, laughed rather scornfully and said she knew that but—and pushed it frantically away. Afterwards said she was afraid of being killed. She often repeats the question asked her and sometimes forgets to answer it. When her age is asked, she says:

"I'm 50 some years."

"What year were you born?"

"It's sot down in the Bible. I can't tell now."

"Can't you tell the year?"

"No, can you?" Laughs as if she had said something witty.

"Do you know where you are now?"

"Do I know where I be now? Morristown Institute."

"What is this building you are in?"

"Why, they say the Barrets own this building."

"Who are all these people we see about here? Are they Barrets?"

"I don't know them all. I wasn't one of these runagates, I guess. There's one that's Dr. Jim."

In reply to questions says: "It looks like it was in the spring, but they say there's two crops in the season—some of 'em do, yes, sir."

"Are any of your family here?"

"Why, they say John Sten's wife's here." (No such name known.)

"Is she a relative of yours?" To this gives a low but apparently irrelevant reply.

"How many children have you had?"

"I had seven." Then whispers something. "George Robinson lives in Arkport, New York." Swears under her breath.

Says in reply to questions that her father died of old age and disease contracted in the war. About her mother says, "My mother's age was against disease. She has, by gosh—some calls it turn of life."

"Was there anything the matter with your mother's mind when she died?"

"Not then, but she had been crazy—had the fever. No, there wasn't anything the matter with my father's mind, but he got childish." Says she has been here 17 years and has had the movements all this time.

CASE NO. XI.—Male, age 53, married, laborer.

Family History.—Parents both natives of this country. The father died of chorea at 40 years of age, and the mother is said to have died in a hos-

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FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.

FIGS. 1 TO 4. CASE NO. XI. Note the extensive movements and peculiar attitudes.

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pital for the insane. A grandmother, three aunts, two uncles, one brother (Case No. XII), and one sister died of chorea, and a living brother and sister have the same disease.

History of Present Illness.—Symptoms of chorea were present as early as 1892. Previous to 1898 the patient had served a short sentence in the State penitentiary. He was then sent to the local poor farm, where, in 1898, he made a vicious assault on the steward. Was sentenced to serve out a period in the county jail, but was so noisy and troublesome there that the governor was induced to pardon him, and he was sent to the State hospital for the insane, and admitted there July 27, 1899. At the time he weighed 139 pounds, but his previous weight had been about 180 pounds. His muscles were of moderate size and firmness. The thoracic and abdominal organs were normal. The left patellar reflex could not be obtained; otherwise nothing unusual was found in the reflexes. Sensation for pain, touch, heat and cold was unimpaired. There were marked, coarse, irregular movements of all parts of the body. Urine examination negative. Temperature, pulse, and respiration normal.

He was fairly well oriented as to time, place, and surroundings, but recognized that his memory was impaired, and said he could not recall names and faces nearly so well as before. Said he did some work at the poor farm, but thought he was not shown sufficient consideration and complained of mistreatment in many ways. Admitted that he once became angry and struck the steward with a cane. He spoke several times of tiring quickly when trying to read.

Subsequent to the above there was no marked change in his mental condition for some time. In March, 1900, he was transferred to one of the men's cottages on account of his irritable, peevish disposition and his inability to walk with the patients on the ward. Complained a great deal about trivial matters, and at times would strike other patients with very little or no cause. Usually ate well, but, occasionally, if something occurred to anger him, would refuse to take any food for two or three meals. He was usually restless and his choreic movements were so marked that he got about with difficulty. On the 21st of August, 1902, he was given a careful examination with the following results:

Physical Examination.—He is a man of good frame, quite well developed, but anæmic and rather poorly nourished. Forehead narrow, low, and retreating, and there is a quite marked prominence in the region of the anterior fontanelle. Ears large, but normal in shape, except that the lobules are adherent. Lower jaw unusually large, and the hands and feet are also very large and bony. Head measurements: A. P. D., 20; B. P., 15.5; B. T., 11.25; M. B., 26.

Sight and hearing normal. Skin generally healthy, except for numerous bruise marks where he has struck himself. Muscles of good size and quite firm. Left patella fractured and the upper fragment is six inches above the knee joint.

Heart sounds and area of heart dullness normal. Pulse full, strong, and regular, but somewhat accelerated. Radial arteries slightly thickened. Veins of the lower extremities slightly dilated. Lungs normal. Palate normal in shape. Teeth poorly preserved and many absent. Tongue clean. Bowel movements regular or slightly constipated.

Pupils equal and react equally, readily, and together for light. No patellar reflex or ankle clonus. The abdominal reflex cannot be obtained on account of the choreic movement of the abdominal muscles. Cremasteric reflexes normal. Sensation for touch and temperature unimpaired. All over the body are choreic movements of the most violent character, but they are worse in the upper half of the body than in the lower (Figs. I to IV). As he lies in bed his arms and legs are thrown about in every direction, and his head also is constantly moving. He frequently strikes his hands and his head against the wall with considerable force and sometimes strikes his face with his hand, but does not seem to feel any pain on account of it. There is little, if any, increase in the movement of the eyeballs or twitching of the lids, but there is marked twitching of the muscles of the face and particularly of the muscles of the lower jaw. At times he has much difficulty in beginning to speak. Frequently he attempts a word several times before he succeeds in pronouncing it, but when once started he speaks fairly well. At times his voice is very high pitched. He protrudes his tongue in a straight line, but in a very jerky way, and it is quickly retracted, though when asked to hold it out he succeeds in doing so for a little time. There is no difference in the movements of the two sides of the body, though his head is almost always held to the left. When asked to rise he assists himself by holding to various objects. He leans far forward, rises on one foot, remains suspended on it for a moment, twists around on it, and then comes down heavily on the other heel. In walking he goes through very similar movements at each step, swaying from side to side, at times executing a hopping movement, and all of the time going through the most varied movements with his arms. He cannot go up or down stairs and sometimes falls even when walking on a flat surface. During the examination he urinates twice, both times rather small amounts. The attendant says he passes urine much more frequently than the other patients, and that each time he has difficulty in getting the stream started, after which it flows intermittently, as if dependent upon spasmodic contraction of the bladder, until he is satisfied. He eats rather rapidly, but masticates his food fairly well, and seems to have no difficulty in swallowing. He feeds himself with a spoon, but spills considerable food. Is able to drink from a cup of water without spilling very much, buttons his clothes with considerable difficulty. Volition lessens the movements decidedly for a time and anger greatly increases them so that occasionally, while sitting in a large, solid chair, if irritated, the violence of his movements will upset the chair.

Mental Condition.—His mental condition is most unhappy, and is constantly dominated by delusions of persecution. He complains particularly

about "being starved," and says the nurses will give him nothing to eat; notwithstanding the fact that his appetite is enormous, and he often eats as much as three of the other patients. He is equally sensitive about other matters and often breaks out in paroxysms of rage on the slightest provocation. These come on more often at night than in the daytime and frequently for hours at a time, during the night, he will keep up an almost constant, loud, bellowing noise, and appear to be in a perfect frenzy. If asked the reason for these demonstrations he generally gives a most trivial cause; thus on one occasion he excused himself by saying that during the day he had been given a vest in the pocket of which was a hole, so he could not carry his tobacco in it. He takes a daily newspaper and reads it regularly, seems to comprehend what it contains, and is quite familiar with current events.

From this time his course was gradually downward. He lost in flesh and his movements, if possible, became even more marked. Occasionally, for a little while, he would seem to gain in flesh, be in better temper, and have a little more control over his body, but these periods were of short duration, and were always followed by still greater retrogression.

On the 25th of December, 1902, an infected area appeared in his right hand. It was opened and treated antiseptically, but he gradually grew worse, and died at 11.30 a. m., on the 2d of January, of septicæmia. During his last illness his movements had been less marked than previously, and this was more noticeable in the affected hand and arm than in other parts of the body. A little before death the movements ceased almost entirely, but this was probably due to progressive weakness.

CASE No. XII.—Male, age 26, single, farmer.

Family History.—See Case No. XI.

Clinical History.—Has never used liquor to excess, but six years ago received some sort of injury to the head. His trouble had been present for at least four years previous to his admission at the State hospital. It was thought to be increasing. He was irritable and had even attempted to injure others. No tendency to suicide. Was filthy in his habits. In the history as given at his admission, he was said to be an epileptic, but no symptom of epilepsy was ever noted after his appearance at the hospital, and it is highly improbable that there ever were any. He was admitted to the hospital in 1882 and lived one year. There is little stated as to his condition during this time, except that he was very much demented, and at times irritable, and that he had well marked choreiform manifestations. The cause of his death is not given, except that he had had more or less constant diarrhœa for three months previously.

CASE No. XIII.—Male, age 43, married, laborer.

Family History.—Patient and parents born in Germany. The father, a man of good habits, died of chorea, as did also his brother. Mother living and well in old age. The patient has one sister and three half-brothers

and sisters, all well. A half sister died of pulmonary tuberculosis at 23. Two children of the patient, not yet grown, are said to be in normal mental and physical condition.

Personal History.—As far as can be learned the patient was healthy in early life. Walked and talked at a year and a half. No history of spasms, rickets, or scrofula in childhood. Attended school eight years and learned readily, but was always a little morose and quick-tempered. Has used beer, whiskey, and alcohol, possibly to excess. When 20 years old was very ill with what was called "the fever" and had severe attacks of a similar disorder at 23 and 40. He is married and has two children, but his wife is divorced on account of domestic trouble.

Present Illness.—The exact date of onset cannot be determined, but he is said to have been more or less disturbed mentally for 15 years, and the choreiform movements have been present for at least that length of time. The movements began in his legs and have progressed slowly until they now involve the whole body. Marked mental symptoms have been present for six years. He was committed to the hospital for the insane at Independence, Iowa, April 6, 1899. According to the physician's return, his insanity was due to intemperance, masturbation, and chorea. He was not suicidal and was not disposed to injure others. When examined was found to be in good physical health and weighed 146 pounds. Choreiform movements were present in the muscles of the extremities, of the face, and of the tongue. They were much less marked in "various parts of the trunk." He was oriented as to time, place, and surroundings, and told a story about as follows: "I am born in Germany; came to this country about 18 years ago, the time they shot one of them presidents. I am a day laborer. I didn't do anything, but they said I was crazy. I am married and have a girl and boy. My wife told me to go away and said she would not do anything for me; said I choked her. She likes other men better. I caught men in bed with her three times. She goes away from home every night. She said to me 'I wish the old devil was dead and out of the way.' As soon as we were married the trouble began. She hated me and scolded me all the time. She would fight me and scratch my face." He remained in the hospital about three years. Was somewhat cross and irritable and frequently made complaints about insignificant matters. At times walked the floor in a restless way. He continued well oriented and talked in a rational manner on most subjects, but persisted in the ideas previously mentioned about his wife. (The history available throws no light on the wife's real attitude.) He seemed to realize his condition and was a fairly good worker about the hospital. In January, 1902, he was discharged to be sent to a private hospital where he evidently did not do well and, on July 28, following, he was returned to the State hospital, at which latter time I saw him.

Physical Examination.—A rather small male, quite well developed and well nourished. Height, 5 feet, 6¼ inches; weight, 140 pounds. Vision probably good. Ears normal in appearance, except that the right has a

well-marked, and the left a slight Darwinian tubercle. Hearing good. Head measurements: B. T., 11.75; B. P., 15; A. P., 19.5; M. B., 23.75. Nothing very unusual in the shape of the head or face. Skin quite healthy in appearance and everywhere of an olive-brown color. Mucous membranes have a normally pink color. Muscles of fair size and quite firm. Muscular power is diminished in the hands. Ridges of tibiae very slightly roughened. Hands and feet of moderate size and normal formation. The patellar and abdominal reflexes considerably exaggerated. No ankle clonus. Cremasteric reflexes normal. Pupils equal and about normal in size. They react equally, consentaneously, and to about the normal degree to light. He is unable to walk a crack, but after much effort it is possible to get and keep his feet together for a short time, and he stands erect with eyes closed without difficulty. No disturbance of the pain and temperature senses, but when he is touched lightly with tooth-picks he has some difficulty in determining the number of points. No one region is affected more than another. Chest well developed and lungs normal. Breathing easy and natural. The apex beat of the heart cannot be seen and, on account of the constant twitching, it is difficult to palpate, but it seems to be in the fifth interspace and about 1.5 cm. inside the mid-clavicular line. Dulness begins above at about the fourth rib. Heart sounds regular, loud and clear. Radial and temporal arteries not abnormally thickened. Pulse normal in rate, but not very full. No varicosities. Palate normal. Teeth largely absent and those present in a poor state of preservation. Tongue clean. Relative liver dulness begins in the mid-clavicular line at the fourth interspace and absolute at the sixth interspace. It lacks about two finger-breadths of extending to the costal arch in the same line. Abdominal organs apparently healthy. Bowels move once each day. No hæmorrhoids. Genito-urinary organs normal. He denies venereal disease and the penis shows no scar. Urine negative. Blood examination: hæmoglobin, 98 per cent; red corpuscles, 5,480,000; white corpuscles, 7,526. In stained preparation the red and white corpuscles appear normal. No differential count made. Temperature, 98; pulse, 74; respiration, 18.

As he lies in bed at the time of examination, he keeps up an almost constant choreic movement. Occasionally the motion ceases, but it is only for an instant. The movement is most marked in the hands, less so in the forearms, and still less in the arms. The head, and more particularly the lips and lower jaw are in frequent motion, but here the movement, except for a slight twitching of the lips, stops at times for as much as a couple of minutes. In the legs the movement is unequal. In an hour's time the left knee is not once elevated while the right is raised, at least slightly, every four or five minutes, and sometimes much oftener. There is an almost constant twitching of the muscles in the fore part of both legs, causing slight flexion and extension of the foot and toes. In the left thigh there is no movement noted except a slight twitching of the quadriceps. In the right thigh this movement is more marked and at the same time that the knee is raised, the leg and thigh are rotated somewhat outward. In the

pectoral and abdominal muscles a frequent moderate contraction is noted. Usually when the abdominal muscles contract the scrotal muscles contract also. At times this latter contraction is marked and bilateral, and both testicles are drawn well upward, but much more often the contraction is only moderate, and then almost invariably affects the right side of the scrotum alone. Occasionally the movement of the muscles of the face is such as to produce grimaces, but not usually. There seems to be slight twitching of the eye-balls in irregular directions, and at frequent intervals the eye-lids are tightly closed for an instant. The tongue is put straight out, but he has difficulty in keeping it out, and it is usually jerked quickly backward and the teeth closed tightly. There is slight difficulty in swallowing and in articulation. Voluntary actions seem to lessen the movements—thus he is able to dress himself, including the buttoning of his clothes and, as he does so, the movements seem less than at other times. Tickling the soles of his feet produces some hyper-extension of the toes, but it is doubtful if this is greater than occurs almost constantly from the choreiform movements. When seated, he often holds to the arms of the chair, apparently to keep his hands from constant motion. At times he sits with his hands clasped in his lap. He rises from a chair without difficulty. In walking the feet are raised more than is normal, and at times this is specially marked, producing a kind of loping gait. His heels always come down first and with more force than is natural. Ordinarily his feet are not separated widely, but at times this is the case and occasionally one flies out to the side as if beyond his control. Occasionally, when he raises his foot, he will hold it quite high for a moment, unable, apparently, to place it, and at the same time he has considerable difficulty in balancing himself. The movements cease when he is asleep. He usually eats heartily and very rapidly.

Mental Condition.—He seems more demented than at the time of his first admission. Knows where he is and recognizes familiar faces, but it is difficult to tell the exact extent of his knowledge, as he does not care to talk on subjects which are introduced, but always wanders off to others which seem uppermost in his own mind. He talks a great deal about God and his heavenly Father, earth, and heaven. Thinks he has no father in the ordinary sense, but that God is his heavenly as well as his earthly father; God made all the earth and the land and made it all for him, and he wants to know if God has not left him a deed. He continually speaks of this father as if he were an ordinary man endowed with a power which is divine. This father has made a home for him in California, and he is expecting every day to be taken there. The father will come with wings and transport him. He speaks of a certain individual who once preached in the hospital and describes him as a man with a long gown, evidently meaning the Episcopal minister. This man, he says, is the "great Satan," though the man himself thinks he is the greatest preacher living. This man, he says, made the Bible, but the heavenly Father will come some day and burn it up; he will turn it into "black dirt," and make a new Bible

out of "pure gold." Questioned further, he says that the heavenly Father will come on the 18th of August next, which will be 10 days before the patient's birthday. He is sure that God will not disappoint him, "for He loves His son." God talks to him "Oh, so many times." God looks just like him (the patient) except that He has a black moustache. Nobody else looks like these two; there is nobody like them in the world. He denies that he ever had a wife, says she never belonged to him; that she ran off the first day; that she began to "devil" him as soon as she secured the license; that she ran round at night with other men; that he had lots of money and she threw it away, gave it away, threw it into the fire. This woman who is called his wife has three children, but they are not his. They are fathered by the woman's own father. There is not a good woman in the world; they are all wicked; he will never have anything to do with another one. The heavenly Father made them all, but he cannot understand why they are not better. He recalls the exact date of his first admission, and thinks he left sometime in January; has been away six months. They took him away to cure his asthma, but they did not do him any good; they could but they would not. He has no chorea; that is only a name the doctors call it; it is asthma; more than half the world has asthma; more than half in the hospital have asthma; the priest at Dubuque could have cured him if he would. He will destroy all the Catholics; he is not a Catholic. He explains his asthma by saying that his mother ran away from the heavenly Father and took him with her and married another man. After that he had nothing but "lickings," and that brought on his asthma. His expression is generally fairly pleasant, and he is quick to take note of the conversations going on about him and to recognize the conditions and peculiarities of other patients. He gives his age correctly, and the present date also; can name the state and national capitals and the President. In other matters he seems to have a fair general knowledge, and his memory is fair. Says 2 plus 4 minus 1 equals 5. Cannot go beyond simple problems of this kind, however. Says he cannot remember things of this kind, as it is a long time since he went to school. All the time the conversation is going on he is keeping up a series of meaningless choreic movements. They affect particularly the head, upper extremities, and trunk. In the feet and legs there is scarcely more than a slight swaying movement. There is some defect of speech.

One month after the above date he was transferred to another State hospital. There had been no material change in his mental or physical condition.

CASE No. XIV.—Male, age 70, widower, farmer.

Family History.—The father, a native of Germany, died at 63 years of age of some septic condition. He drank beer moderately; had no chorea. The mother, also born in Germany, died of some bowel trouble at 85 years of age. She was "nervous" in her later years, but it is very doubtful if she ever had chorea. She used no liquor. The patient had three brothers

and four sisters, of whom one brother and two sisters are living and well. One brother and one sister suffered a good deal from rheumatism, and the brother died from that disorder. Both are said to have had the same movements as the patient, except that they were of mild degree. Neither showed any mental disturbance. Another brother died when about 75 of unknown cause. Another sister is supposed to be living and well, but this is not positively known.

The patient is married and has six girls and four boys living. One girl died in infancy of "cramps." At admission patient was accompanied by four children who stated that all of the ten children are married and in turn have children, all of whom are healthy. It was noticed, however, that two of the girls seemed quite nervous, and at a later time when the oldest son, who is 40 years of age, was seen, it was observed that he at times had twitchings in the thumbs, spasmodic movements in the shoulders and jerky movements of the whole body. He was not very bright, and had had asthma quite badly for a good many years. A letter, received from the family physician, states that all the children seem to be quite as healthy as the average in a general way, but that all are of a neurotic temperament and all are quick and jerky in their movement and speech.

Personal History and Present Illness.—As far as can be learned, the patient was normal in childhood and young manhood. In early life drank a little beer, but never to excess. For many years past has taken no liquor whatever. He was married at 27, and two years later went to the Civil War where he served three years. Early in his period of service he had a severe attack of dysentery, lasting three months. At a later time, somewhere near the close of the three years, he was engaged in a severe, forced march, lasting three days. On the third day he became completely exhausted and was unable to continue with the troops. He gives the date as September 24, 1864, and says that directly after this the choreiform movements began, that at first they were not so bad as they now are. The children are rather uncertain as to when the signs of chorea first appeared in their father, but believe they were present as far back as any of them can remember, and their mother has told them that ever since the patient returned from the war these movements have been noticeable whenever he was excited or angry, though they were not very bad until he was past 40 years of age. Eighteen years ago they became much worse, and at about that time signs of mental aberration were first observed. Since then his wife has had entire charge of the property, and it is probable that the father's mental disturbance has been greater than the children are willing to admit. For a good many years he has done a little work about the farm and yard, but could not work steadily for any great length of time; was quite unsteady on his feet and it was impossible for him to stand still. If he did not keep his feet almost constantly moving he would fall over. Eighteen years ago he began to talk about getting a pension, but has not been able to get it, and this has worried him a great deal. For 10 years past he would run away at times. At first he would return voluntarily, but of late

it has been necessary for the family to bring him back. During the past summer he was very bad in this respect. Last fall he began to complain of "burning up" and has spoken of it much more frequently the past spring and summer. He would often say to one of his children that his blood was "getting hotter all the time." Last summer he began to have delusions that he was Christ and has continued since to believe this. He also at times says he is the governor. Two days before coming here he tried to kill himself. Previous to this he had repeatedly said that he could not live. He secured an old rusty knife, sharpened it a little, and made eight or ten cuts on his throat sufficiently deep to bleed quite freely. For 12 or 15 years he had been talking about the Free Masons. He has never belonged to them and, so far as is known, has had no reasonable grudge against them. One week before his abortive attempt at suicide, however, he sharpened an old horseshoe to use as a weapon and with this and a large monkey wrench he started out afoot to the neighboring town with the intention, as he expressed it, of killing all the Free Masons.

So far as the children know, there has been no difference in the movements of the two sides of his body. There has never been any trouble in swallowing, but the patient's appetite has been quite irregular. At times he ate enormous quantities, and at others would take almost nothing. He was sent to the State hospital September 18, 1902.

Physical Examination.—A medium sized male; height, 5 feet, 6½ inches; weight, 112½ pounds; somewhat stooped and considerably emaciated. The skin has a wrinkled appearance. Hair iron gray and almost wholly absent over the top of the head. Eyes pale blue and have a much faded appearance. Moderate arcus senilis. Vision rather poor. Ears are small and stand out prominently from the head. The right presents a fairly well-marked Darwinian tubercle. Hearing fair.

Forehead low and narrow. Right malar region much more prominent than left, and left side of head much more prominent than the right, giving to the head and face a peculiar, unsymmetrical appearance. Nose very prominent and eyes deep set. Skin falls in loose folds about the face. Muscles of medium size but not very firm.

Pupils equal and rather small; react equally but rather slowly to light. Patellar reflexes somewhat diminished. No ankle clonus. The Romberg sign cannot be made out, as he cannot even keep his feet together. Cremasteric and abdominal reflexes sluggish. As nearly as can be made out, sensibility for heat and cold is normal. He bears the pricking of a pin everywhere with but little manifestation of pain, though he says it hurts him. It is impossible to secure any reaction to pricking the soles of his feet, though he says he feels it.

Chest narrow and not very well developed. Some increase of percussion resonance and some lengthening of the expiratory sound. Apex beat of heart in fifth interspace about one cm. outside midclavicular line. Dulness begins above at third interspace. No murmurs. Heart sounds not very strong and quite irregular. At times the rapidity of the beat will be almost

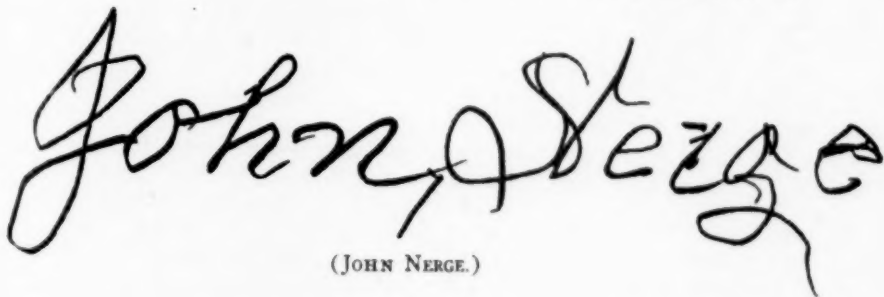
twice as great as at others. This acceleration occurs irregularly, but on an average of about every two or three minutes. No weakening of the sounds corresponding to the increase or decrease of the rate. Radial arteries moderately thickened. Pulse very fair except for its irregularity.

Tongue coated, cracked, and not very moist. He protrudes it readily, but it is quickly withdrawn and continues to rapidly jerk outward and inward. He seems to control the action of the jaws with considerable difficulty at the time, and twice the jaws shut tightly on his tongue. Teeth badly preserved and many absent. The abdominal organs seem ordinarily healthy, except for a complete, right-sided, indirect, inguinal hernia which comes down when he stands erect and is reduced with ease.

At admission, temperature, 99.8; pulse, 64; respiration, 16. The blood examination shows 5,680,000 red corpuscles and 14,800 white corpuscles. Urine: Cloudy, reddish yellow, acid, sp. g. 1025, no sugar, some albumin, no casts.

As he lies in bed there is an almost constant movement in some part of his body. His head is much of the time raised from the pillow, but sometimes as if in fatigue he supports it with his hands clasped behind. Voluntary muscular action inhibits the movements to some extent. Thus he can hold his head still for a little time, but such effort is usually followed by an unusually vigorous series of movements. Sometimes his head moves from side to side, and sometimes forward and backward. In a general way there is a tendency towards circular movements. His eyes and the lids are fairly quiet, but there is frequent twitching of the muscles in the cheeks, thus causing an elevation of the corners of the mouth. When he supports his head with his hands the arms seem fairly quiet, but when his arms lie on the bed there is almost constant, slight twitching of the fingers with occasionally more marked movements in the forearms, and, more rarely, movements in the upper arms. At the time of the examination he was lying on his back in bed with the right leg crossed over the left. In this position the movement is confined exclusively to the right leg. It consists chiefly in flexion of the toes, particularly the great toe, and a contraction of the adductors of the thigh. When the position of the legs is reversed, so that the left lies over the right, the movements continue to be confined to the right leg. When his attention is called to the matter he says the movement is the same on both sides of his body and under the stimulus of his attention slight movements begin to appear in the left leg. When he rises he sways from side to side and finds it necessary to move his feet about in order to keep from falling. When he walks the peculiar, swaying, jerking movement continues. Some steps are long and others are cut short with a jerk. At times he rises on his toes or heels and jerks quickly to the right or to the left, evidently with some difficulty maintaining his balance. Also in walking he is not always able to go straight ahead, but will whirl around on one foot and start in a new direction, although he is always able to return to his proper course again. So far as can be seen there is no more tendency to turn to one side than to the other.

Calling his attention to his movements always increases them. They cease when he is asleep. A specimen of his writing is given below.

A large, cursive handwritten signature that reads "John Nerge". The letters are fluidly connected, with a prominent loop at the end of the word "Nerge".

(JOHN NERGE.)

Mental Condition.—He lies quietly in bed except for a slight constant movement in parts of his body. He knows where he is, recognizes the character of his surroundings, and can tell the name of Independence. He knows the year and month and gives the day of the month approximately. Says he knew where he was coming and was willing to come because he had no other place to go. He admits that he attempted to commit suicide, and, when asked why, says something about having "military blood" and that it is different from other blood. Later, when asked the same question, he says that he is Christ; that he tried to commit suicide in order that he might be sent here and wanted to be sent here in order "to prove out the government." In speaking to the physician he often uses the expression "your government" and seems to feel in some way that he lives under a new regime. It may be that he refers to the divine government. He names the president and previous president without difficulty, but cannot name the governor. On prolonged questioning he seems to have a better grasp of affairs and to be less demented than would appear on a superficial examination.

He was kept in bed the greater part of the time until the third day of October, after which he was permitted to be up. While in bed his morning temperature taken in the mouth varied from 96 plus to 97 and the evening temperature was 97 or 97 plus. His pulse ranged from 60 to 110, and his respiration from 16 to 24. Occasionally, he would eat a good meal without persuasion, but usually it was necessary for the attendant to feed him with a spoon. He ordinarily swallowed his food with almost no mastication. Occasionally he would spit it out almost as soon as it was placed in his mouth. When he did not eat well he explained it by saying that he did not wish to burden his family with the expense. He continued to talk of himself as the governor and once said he was the Christ. After getting up he did fairly well until the morning of November 5 when he became very restless and violent. He broke some of the furniture and also the window glass in his room, attempted to injure the nurses and the

other patients, and refused to eat anything. Was given one-eighth grain of morphia, hyperdermatically twice but as this had no effect he was placed in a tub of water, ranging from 98 to 110 degrees, and was kept there for 25 minutes. At first he was very troublesome in the bath, but eventually went to sleep and was returned to his room and remained asleep until noon. He then ate a little dinner and after dinner became very noisy and restless. Another hot bath had no effect. As he became more noisy the violence of his movements increased.

During the entire month of November he continued much more noisy and restless than previously, though not so bad as on the 5th. Almost all of this time, he refused to take food, and it was necessary to feed him mechanically, even to the extent of giving him water in this way. It is possible that he was in fear of being poisoned, since on a few occasions, he would drink water from the water bucket if permitted to do so alone, but would not take it if given by anyone else. Several times during the month, hot baths were tried but with very little effect. During December he was very quiet and remained in bed, but refused to take either solid or liquid food, and it was necessary to feed him by means of a tube. His mouth became very dry and the tongue, lips, and interior of the cheeks were covered with a half-dry, flaky material. His temperature at this time was 96, or even slightly lower in the morning, and usually about 97 in the evening. His pulse varied from 56 to 94, and his respiration from 16 to 22. At the end of December his weight was 99 pounds. At that time he began to eat a little, and gradually gained in strength so that by the middle of January he was able to be up again, but almost immediately after getting up he again refused to eat and was returned to bed. In the latter part of January he became very noisy, but not violent. In February he again began to eat some, but did not regain his former strength and remained in bed until his death which occurred on the 17th day of March. During the early part of March, so far as his strength permitted, he was very noisy and restless. Several times he got out of bed and broke window panes, and often he would throw himself on the floor and strike his head and hands against it and the wall as hard as he was able. His movements were more marked on the day preceding his death than for a long time previously, and he also seemed much better mentally. His death was unexpected, and no special cause could be assigned for it. During the last two weeks he had developed a marked fancy for looking at himself in a looking glass.

CASE No. XV.—Male, age 41, married, weaver.

Family History.—Father died in a hospital for the insane with choreiform trouble. Mother died at 71 with heart trouble and paralysis. No blood relationship between them. They had five sons and three daughters. Two sons died when young, cause unknown. Two sons and two daughters are living and well. The remaining daughter is choreic and has some mental trouble, and the remaining son is the patient described. He is

married and has four children, the oldest and youngest of whom are excessively nervous, and one at least is an imbecile and is practically an invalid from some cause. The other two are said to be normal.

Personal History.—The patient was born in New York, and when first admitted to the State Hospital, January 4, 1896, was 35 years old. No history of his childhood, except that, when a baby, he cried a great deal and seemed in pain, no cause assigned for it. He was not intemperate until after this illness appeared.

Present Illness.—Was married at 21, and even then was "nervous," but, according to his wife, this condition was not very noticeable until nine years later when it grew much worse. He became very amorous and thought his wife was untrue to him. Was filthy in his habits and speech and very ugly about the house. Often threatened suicide, but never attempted it. A little time before coming to the hospital, while blasting stone, a charge of powder went off near him, and after that his hearing was impaired. His wife thinks that his movements and mental condition were both worse directly afterward. He would sit like one dreaming for hours at a time and did not seem able to fix his mind on anything. Thought he ought to be in possession of a hotel which his brother really owned and worried greatly because of this. When admitted at the hospital he was well nourished, with large firm muscles. Complained of a roaring in both ears and could hear the ticking of a watch only at one foot distance. Vision, smell, taste, and the sensations and reflexes were normal. He was oriented as to place and surroundings and talked in a rational manner on most subjects. His urine contained considerable albumin. Four months later he was discharged. The albumin had disappeared from his urine, but he had well marked choreiform movements and was described as "feeble minded." Three months later, he was returned and continued at the hospital until his death in 1903. At first he was quiet and inoffensive, and made no trouble except that he often requested to be released so that he might return to his family. Talked often about his business (weaving) and thought he should be at home in order to care for it. Said he could make a good deal of money and support his family in that way, though, as a matter of fact, he was quite unable to do more than the simplest labor. In 1899 he was noted as disoriented as to time and place and could not do the simplest sums in addition and subtraction. Still talked at every opportunity about going home and thought he could do a good deal of work. Was nervous and easily excited. In 1900 he had become unable to do work of any sort, was noisy at night and difficult to manage, and his movements had grown much worse. He occasionally quarreled with other patients, but was not particularly irritable. At this time, also, he began to eat rather excessively, and would steal food from other patients when opportunity offered. He grew gradually worse both mentally and physically. The following examination was made October 21, 1902.

Physical Examination.—The patient is a large male, well developed and well nourished; height, 6 feet $\frac{1}{4}$ inch; weight, 186 pounds. He still stands erect, though he walks with many contortions. Hair slightly tinged with gray. Eyes deep set. No arcus senilis. Vision seems quite good. Moderate ptosis of eyelids. Complexion dark. Forehead rather low, otherwise nothing unusual in appearance of head or face. Ears symmetrical and about normal in appearance. No Darwinian tubercles. He says his hearing is good and that there is no difference in the two sides, but it is evidently considerably impaired, and he hears a watch only when held a foot or less from his head. Skin healthy in appearance. No scars of any importance on the body. Muscles of good size and quite firm.

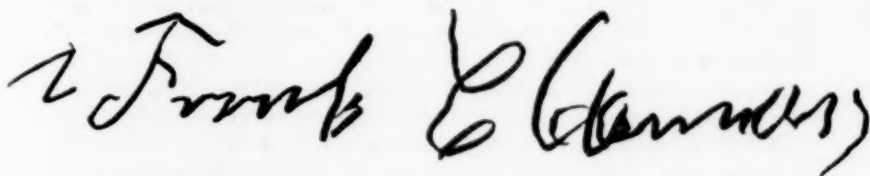
Chest broad and well developed. Breath sounds very irregular, but otherwise normal. Apex beat of heart in the fifth interspace and heart area normal. Heart sounds not quite regular, otherwise normal. Radial arteries soft and pulse quite good, rate 62. Abdominal organs seem healthy.

Pupils equal and about normal in size. They react for light and distance. Patellar reflexes both considerably exaggerated. Quite well marked ankle clonus. No quadriceps spasm. He can put his feet together and stand with eyes closed for a short time, probably as long as with eyes open. Cremasteric reflexes normal. Abdominal probably normal, but difficult to make out since his abdominal muscles are in almost constant movement. No Babinski. So far as can be seen sensibility to heat and cold and touch and pain are present, but their degree is difficult to make out. He bears quite sharp pricking with a pin with but little manifestation of pain.

As he lies in bed the most active movements are in the head, neck, abdomen and scrotum. The entire abdominal muscles are in almost constant movement. The scrotum also is in almost constant contraction or semi-contraction, being never completely relaxed. There is no movement whatever in his feet, legs or thighs as he lies undisturbed, but when his soles are pricked, the feet and legs make two or three quick, spasmodic jerks, always in the line of extension and flexion. As he lies with hands and arms beside his body, there is, at long intervals, a slight, sharp flexion of the forearm and hand on the arm; more often there is a slight extension of the hand on the wrist, but the most common movement in the upper extremities is one confined to a single muscle or small group of muscles in the hand or forearm, producing only a slight twitching or movement of a single finger. There is a very frequent but slight and rather rhythmic contraction of the muscles in the chest, producing an irregular respiration. He usually lies with his head flat on the pillow, but it is very frequently drawn from one side to the other, and occasionally it is drawn forward on the chest. Generally, there will be three or four movements of flexion, and then for some time the head will be drawn from side to side without further movement anteriorly. The mouth also is in very frequent motion, the movement here consisting of a contraction and relaxation of the orbicularis oris. His eyelids frequently contract firmly for a

considerable interval, then relax slightly, and then again contract slightly for a couple of times, after which they remain open for a period. The muscles of speech seem particularly affected, and it is impossible to understand the noises which he makes, though he evidently comprehends a part of what is asked him and at times attempts to answer. When sitting in a chair his head is in almost constant movement, consisting in a flexion of the head on the chest and a lateral swinging movement of the head when in this flexed position. The movements of the eyelids and mouth are as above. The jerking and twitching is seen in both hands, but is much more marked in the right than in the left. Occasionally, both hands take part in some coarse movements, and, following this, are a little quieter for a short time. He sits down in a chair with difficulty, almost falling into it, and as he rises his hands, arms, legs, and head exhibit a variety of coarse movements. In walking he starts off with a rush and nearly always moves quite rapidly when in motion at all, but frequently he quickly slows up or altogether stops with a sort of jerk. His heels come down heavily, the right more so than the left, and the remainder of the foot follows with a slap. The left leg and foot are turned outward more than the right, and the left leg is always more or less flexed at the knee. As he brings himself up short in his walk, there is often a tendency to sway to the right or to the left. Handling an arm or leg at once makes its movements worse. Urine examination: Clear, amber, acid, sp. g. 1020, no albumin, sugar or casts. Blood count: red blood corpuscles, 5,568,000; white corpuscles, 9,856.

A specimen of his writing is given below:

A handwritten signature in dark ink, reading "Frank C. Chapman". The script is cursive and somewhat stylized, with a large, sweeping "F" and a long, trailing flourish at the end.

(FRANK C. CHAPMAN.)

Mental Condition.—His face generally has an anxious, worried expression, and his clothing is usually in more or less disorder. He is no longer able to speak so that he can be understood, but at times he tries hard to say something. On account of this speech defect it is difficult to learn his exact mental condition. He still frequently picks up a newspaper and evidently comprehends something of its contents, for he will take it to the nurse and point out certain paragraphs. Not infrequently, however, he is found holding a paper upside down and acting as if reading it. In speaking to him it is often necessary to repeat a question several times, while he looks at the questioner in a stupid way, before a response is secured. He never makes any attempt to get the other patients to under-

Physical Examination.—The patient is a large male, well developed and well nourished; height, 6 feet $\frac{1}{4}$ inch; weight, 186 pounds. He still stands erect, though he walks with many contortions. Hair slightly tinged with gray. Eyes deep set. No arcus senilis. Vision seems quite good. Moderate ptosis of eyelids. Complexion dark. Forehead rather low, otherwise nothing unusual in appearance of head or face. Ears symmetrical and about normal in appearance. No Darwinian tubercles. He says his hearing is good and that there is no difference in the two sides, but it is evidently considerably impaired, and he hears a watch only when held a foot or less from his head. Skin healthy in appearance. No scars of any importance on the body. Muscles of good size and quite firm.

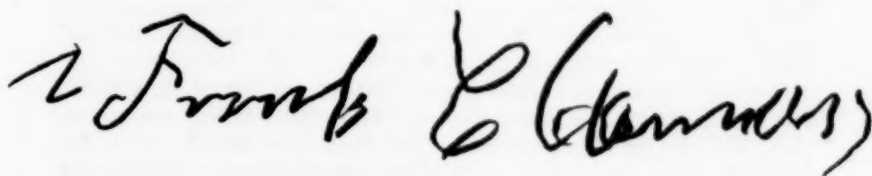
Chest broad and well developed. Breath sounds very irregular, but otherwise normal. Apex beat of heart in the fifth interspace and heart area normal. Heart sounds not quite regular, otherwise normal. Radial arteries soft and pulse quite good, rate 62. Abdominal organs seem healthy.

Pupils equal and about normal in size. They react for light and distance. Patellar reflexes both considerably exaggerated. Quite well marked ankle clonus. No quadriceps spasm. He can put his feet together and stand with eyes closed for a short time, probably as long as with eyes open. Cremasteric reflexes normal. Abdominal probably normal, but difficult to make out since his abdominal muscles are in almost constant movement. No Babinski. So far as can be seen sensibility to heat and cold and touch and pain are present, but their degree is difficult to make out. He bears quite sharp pricking with a pin with but little manifestation of pain.

As he lies in bed the most active movements are in the head, neck, abdomen and scrotum. The entire abdominal muscles are in almost constant movement. The scrotum also is in almost constant contraction or semi-contraction, being never completely relaxed. There is no movement whatever in his feet, legs or thighs as he lies undisturbed, but when his soles are pricked, the feet and legs make two or three quick, spasmodic jerks, always in the line of extension and flexion. As he lies with hands and arms beside his body, there is, at long intervals, a slight, sharp flexion of the forearm and hand on the arm; more often there is a slight extension of the hand on the wrist, but the most common movement in the upper extremities is one confined to a single muscle or small group of muscles in the hand or forearm, producing only a slight twitching or movement of a single finger. There is a very frequent but slight and rather rhythmic contraction of the muscles in the chest, producing an irregular respiration. He usually lies with his head flat on the pillow, but it is very frequently drawn from one side to the other, and occasionally it is drawn forward on the chest. Generally, there will be three or four movements of flexion, and then for some time the head will be drawn from side to side without further movement anteriorly. The mouth also is in very frequent motion, the movement here consisting of a contraction and relaxation of the orbicularis oris. His eyelids frequently contract firmly for a

considerable interval, then relax slightly, and then again contract slightly for a couple of times, after which they remain open for a period. The muscles of speech seem particularly affected, and it is impossible to understand the noises which he makes, though he evidently comprehends a part of what is asked him and at times attempts to answer. When sitting in a chair his head is in almost constant movement, consisting in a flexion of the head on the chest and a lateral swinging movement of the head when in this flexed position. The movements of the eyelids and mouth are as above. The jerking and twitching is seen in both hands, but is much more marked in the right than in the left. Occasionally, both hands take part in some coarse movements, and, following this, are a little quieter for a short time. He sits down in a chair with difficulty, almost falling into it, and as he rises his hands, arms, legs, and head exhibit a variety of coarse movements. In walking he starts off with a rush and nearly always moves quite rapidly when in motion at all, but frequently he quickly slows up or altogether stops with a sort of jerk. His heels come down heavily, the right more so than the left, and the remainder of the foot follows with a slap. The left leg and foot are turned outward more than the right, and the left leg is always more or less flexed at the knee. As he brings himself up short in his walk, there is often a tendency to sway to the right or to the left. Handling an arm or leg at once makes its movements worse. Urine examination: Clear, amber, acid, sp. g. 1020, no albumin, sugar or casts. Blood count: red blood corpuscles, 5,568,000; white corpuscles, 9,856.

A specimen of his writing is given below:

A handwritten signature in dark ink, reading "Frank C. Chapman". The script is cursive and somewhat stylized, with the first name "Frank" being more legible than the last name "Chapman".

(FRANK C. CHAPMAN.)

Mental Condition.—His face generally has an anxious, worried expression, and his clothing is usually in more or less disorder. He is no longer able to speak so that he can be understood, but at times he tries hard to say something. On account of this speech defect it is difficult to learn his exact mental condition. He still frequently picks up a newspaper and evidently comprehends something of its contents, for he will take it to the nurse and point out certain paragraphs. Not infrequently, however, he is found holding a paper upside down and acting as if reading it. In speaking to him it is often necessary to repeat a question several times, while he looks at the questioner in a stupid way, before a response is secured. He never makes any attempt to get the other patients to under-

stand him. Is rather emotional and not infrequently cries, especially when trying to indicate his troubles. If he has hallucinations or delusions they are not elicited. He eats excessively, but aside from asking for more food and frequently indicating that he wishes to be discharged, he apparently finds little to complain of.

February 9, 1903.—Subsequent to the above period little change in his condition was noted until yesterday when he seemed to the nurse unusually irritable. He struck at several other patients and repeatedly tried to get out of the doors and windows. This morning he was unable to get up and was carried to the sick ward. His temperature was 103.8; and respiration, 26. Pupils equal and reacted normally to light. Many rales were found in his lungs. At noon his temperature was 104.8 and respiration 48. He was unable to swallow at noon or afterward. All of this time he was suffering severely from dyspnoea and his pulse was so weak and rapid that the nurse could not count it. His choreiform movements continued to the last.

A specimen of urine taken post mortem resulted as follows: Clear, amber, acid; sp. g. 1022, some albumin, no sugar, no casts, many epithelial cells.

CASE No. XVI.—Male, age 74, widower, farmer.

Family History.—The father, a native of Norway, died of unknown cause. It is not known if he had chorea. The mother had chorea and died of pulmonary tuberculosis. A sister of the patient also had chorea. The patient is married and had nine children, four of whom, at from 8 to 27 years of age, died of pulmonary tuberculosis. Two sons and three daughters are living and well physically. All are very commonplace people and one is distinctly defective. All are married and all but one have large families, none of whom is as yet choreic.

Personal History and Present Illness.—Patient was born in Norway and was a very strong and vigorous man in early life. Served through the Civil War and for many years drank heavily, but not of late. No history of rheumatism. For at least 10 years has had choreiform movements and at the time of their appearance he was drinking unusually heavily. Two years later his wife died, and he has since been depressed. For four years there has been distinct mental impairment. He has been negligent and unthrifty in business. Signed a note for \$5000 which he was compelled to pay. Became very melancholy and twice attempted suicide, once by jumping into a cistern and once by holding his head under water in a tank. Both times was rescued with difficulty. Was admitted to the State hospital, February 6, 1899. For a month previously he had had diarrhoea and had very little control over his bowels.

Physical Examination.—A medium sized man, rather poorly nourished. Height, 5 feet, 8 inches; weight, 136 pounds. Hair tinged with gray. Eyes blue, vision fair. He reads with the aid of glasses. Face broad, cheek bones prominent. Head measurements: A. P., 18.5; B. P., 14;

M. B., 20.5; B. T., 11.5. Ears normal in appearance and hearing good. Skin fairly healthy. Muscles small and soft.

It is very difficult to examine the heart and lungs, but so far as can be determined, there are no gross lesions. The radial arteries are moderately thickened, the temporal arteries, very hard and prominent. Teeth much worn and many absent. Abdominal organs healthy as far as can be determined. He urinates about twice at night. Urine clear, amber, acid, sp. g. 1025, no albumin, no sugar, microscopical examination negative.

Knee jerks slightly exaggerated. Pupils equal and react rather sluggishly to light. The tongue is protruded straight, but is quickly withdrawn on account of its choreic movements. During the examination, or when disturbed in any other way, there is almost constant, coarse, diffuse, choreiform movement. When asleep the movements cease and when in repose they are much diminished. He has little control over the muscles of his face. A voluntary effort with his hands decreases the movements in the hands temporarily, but subsequently the movements are all increased. He is unable to feed himself.

Mental Condition.—He speaks English poorly, and this, combined with his impaired articulation, makes it difficult to get an accurate idea of his mental condition. When no one notices him, he is silent, but if anyone attempts a conversation he is quick to enter into it, and will continue talking for some time, even if no one listens. His remarks are always more or less incoherent. As nearly as can be determined, he is completely disoriented as to place and almost as much so for time and persons. He has no appreciation of the place where he is, but is surprised to find so many people about him. Thinks he missed his train on the way and accidentally reached his present location. Says he is going back to Norway soon "if God permits." In talking he often uses the expression "if God permits." He is dissatisfied with his present position, but is not much given to complaining. Has almost no knowledge of current events.

March 4, 1899.—Says he is getting better every day and seems quite content. When anyone will listen talks a great deal. Frequently refers to his guardian by name, but his remarks are so incoherent that it is impossible to understand what idea he means to convey. His coarse movements continue.

April 10, 1899.—Says he has been in the hospital more than a year. He thinks it is an immense boarding house and is apparently entirely satisfied to remain. Says his movements have been present "a year or two." Uses this expression to answer all questions involving the element of time, regardless of its appropriateness. Sometimes says he is getting "better and better," and sometimes that he is completely cured. He was visited a few days since by his guardian. Seems to remember that the visit occurred, but has no idea of how long it was. Whenever started, talks on indefinitely, regardless of whether anyone is listening.

The notes subsequent to this date are not very full, but there does not appear to have been any marked change for some time. He grew slowly

weaker and his choreiform movements became more marked, so that it was increasingly difficult for him to get about. In 1901 he could walk only short distances and even then frequently fell. His movements also had become more marked. He was much demented, could remember very little and often soiled his bed and occasionally his clothes. Required the assistance of a nurse in dressing. Much of the time was restless, but talked less than at first. Was never particularly irritable. His general health had continued quite good, but at the close of 1901 he began to lose weight. On January 10, 1902, was placed in bed because he had fallen so often. He also was more confused and more noisy than before. His temperature, pulse and respiration were normal and continued so up to the 22d. On the night of the 21st he became faint while sitting on the stool and fell over. Was unconscious for 10 minutes, and his pulse was almost imperceptible. After consciousness returned he was still very weak. Up to the 27th he had no further fainting attacks, but was constantly in bed and was more noisy, restless, and confused than before. The afternoon of the 27th had another fainting attack. Temperature at 6 p. m., 95.4; pulse, 80; respiration, 20. He died at 2.50 p. m. on the 30th. On the 28th and 29th he was very noisy and confused, but all day of the 30th was stupid. Paid little attention to anyone and could scarcely swallow. At 6 a. m. temperature, 97; pulse, 66; respiration, 32. At noon temperature, 96.8; pulse, 68; respiration, 34.

CASE No. XVII.—Male, age 72, married, farmer.

Family History.—The paternal grandfather, a native of Germany, was a heavy drinker and a man of very ugly disposition. He died at 95, probably of old age. Had been totally blind for some time. A relative states, "He was not insane other than would occur on account of old age." The father, also born in Germany, was a moderate drinker and a very violent-tempered man. He died at 80 years of age. He had some motor disturbance, though it is not positively known that it was chorea. The mother was born in Pennsylvania, and died at 80 years of age of dropsy. No nervous or mental disorder in her family. They had four sons and seven daughters. All the sons are living and, excepting the present patient, are well. One sister died "of fits" at 35 and another of "child-birth" at 30. The others are living. One of the sons drank to excess. None of the other children had a nervous condition in any way similar to that of the patient.

Personal History.—The patient was strong and hearty in babyhood and has never suffered from any severe ailment except as below. He has had several attacks of quinsy and at 33 had a severe attack of fever. Ten years ago he was kicked in the abdomen by a colt. He was very ill for some time after this. He drank beer and whiskey moderately and smoked excessively. From childhood had a vicious temper. He was married at 32 and has had five sons and one daughter, all living. One son constitutes Case No. XVIII. The other children are all well, though all have a ner-

vous temperament. The oldest son is married and has five healthy children, the daughter has two healthy children.

Present Illness.—The wife thinks that ever since their marriage the patient has been changeable, nervous, and excitable. His jerky movements came on gradually and have certainly been present for many years. They appeared first in his legs. Twenty-four years ago he received a slight sun-stroke, and after this his mental disorder was more pronounced. He became indifferent to his wife, refused to provide for her and was jealous of her. On the 24th of March, 1892, was committed to the State hospital. Two years before he had had an acute outbreak of insanity, lasting six weeks. This second attack had begun 10 days previously. He had threatened to kill himself and wife and had been prevented only by physical force. Thought his wife was the cause of his troubles. Often used indecent language and had a particular dislike for the churches and church members, though this was contrary to his previous views. In the language of the committing physician he would "rave like a maniac and smash everything he could get hold of. Often tore his own clothes." When first admitted he was described as emaciated, and ate and slept poorly, but he improved after a time and twice went home on parole, but each time was returned. Was finally discharged October 14, 1892. On the 24th of March, 1899, he was re-admitted. He had been at home in the interval, but twice had been up for re-commitment. He had had frequent outbreaks of uncontrollable temper, would not undress at night, and would sleep in his day clothes for months at a time. At one time became very religious, but later was quite the reverse. The following is an abstract of the notes made at the time of his second admission.

He is fairly well nourished; weight, 137 pounds. Muscles of fair size, but soft and flabby. Skin pale, dry, and wrinkled. Temperature, 98.2; pulse, 84; full and regular. Heart area slightly enlarged, a blowing, systolic, aortic murmur. Lungs, abdominal and genital organs normal. No disturbance of reflexes or sensations noted. Choreic movements are present in the entire body, breathing is somewhat affected by these movements. He is oriented as to time, place, and surroundings. Says he always got along well with his family until 10 years ago, when he began to have trouble, and it has increased ever since. Says "It finally ran me out of my house. It grew out of jealousy as much as anything between me and my wife. I found fault with her because she neglected home affairs too much. She would go to camp meetings and stay two or three weeks at a time and leave me and the children to look after things at home. She finally left me. She had nothing to live on, and I got her to come back, but things have been getting worse." He thought his wife was improperly intimate with other men, and he talked to her about it, but she used him badly. She attended camp meeting too much, and the preachers came constantly to the house. Except for his remonstrances his wife would have become criminally intimate with them. One day his wife and son attacked him, and threw him into the wire fence because he wanted to take a team

out of the barn. He swore at them and threatened them. Once threatened to kill his wife. (The history shows nothing wrong on the part of the wife.)

The following is an abstract of the ward notes made from time to time:

June 28, 1899.—Has increased in weight, is idle, and shows no interest in any work. Says he has no wife; he had one, but he thinks she is now divorced.

February 28, 1900.—In December had a slight attack of illness, considerably reducing his weight. Is again in good health and weighing more than before. The choreic movements and his mental condition continue as before.

May 7, 1900.—Recently has decided that a young insane man on his ward is his son and treats him accordingly. This morning he refused to put on his coat, said he had been scared by the smell of urine in it and would never touch it again. When the attendant attempted to compel him to put the coat on he threw himself on the floor and kicked and bit and struggled with everyone who came near him. Was moved to another ward, where he immediately became quiet; acted as if unable to remember anything of the previous trouble and asked who had taken his coat. His wife, when informed of the occurrence, said he had behaved similarly at home, many times.

April 30, 1901.—Is generally restless and always rather irritable. At times attacks other patients and a few days since he passed through an attack almost exactly like the one detailed above. Does no work.

January 31, 1902.—Has recently had a severe attack of colitis, but recovered, and is now in very fair general health.

On October 29, 1902, I had an opportunity to give him a careful examination, of which the following is a record:

Physical Examination.—He is a medium sized male, fairly well developed, but rather poorly nourished. Hair white and very thin over the top of the head. Face covered with a moderately heavy growth of white whiskers. Eyes bluish-gray, slight arcus senilis. He says his vision is good. Head measurements: B. T., 11.25; B. P., 15.5; A. P. D., 19.25; M. B., 24.25. Forehead rather low and somewhat retreating. Head rather more prominent on the right side than on the left. Eyes deep set and face much wrinkled. Ears of medium size and symmetrical in appearance. In both, the helix is much flattened and turned backward. No Darwinian tubercles. As nearly as can be told, hearing is fair. Skin dry and hangs in loose folds everywhere. No scars of any importance. Complexion medium. Muscles small and flabby.

Pupils equal and rather small. They react equally and consentaneously, but slowly to light. Patellar reflexes equally and considerably exaggerated. No ankle clonus. He has a good deal of trouble in keeping his heels and toes together at the same time. Generally as soon as the heels come together the toes spring outward and vice versa. Finally he succeeds in bringing both together and shuts his eyes for a little time. His body

wiggles and sways about a good deal, but he does not fall or show any particular tendency to fall. No Babinski. Abdominal reflexes difficult to make out on account of the movement of the abdominal muscles; probably about normal. Scrotum firmly drawn up. Only a very slight scrotal reflex is made out.

Chest moderately well developed except that it is rather hollow above. Supra- and infra-clavicular fossæ prominent. Percussion note decidedly impaired, but no real flatness and no rales, coughing or other sign of lung disturbance. The apex beat of the heart cannot be seen and, on account of his movements, cannot be felt. It is heard best in the fifth interspace and a little outside the mid-clavicular line. Heart dulness begins above at the third interspace. There is a prolonged, blowing, musical, aortic, systolic murmur heard more or less all over the front of the chest, but especially in the aortic region. The musical element is gradually lost as one goes upward, and in the carotid arteries a well-marked blowing, but not musical sound is heard. The radial arteries are very firm. Pulse fairly full and strong, not quite regular. Slight œdema over the tibias.

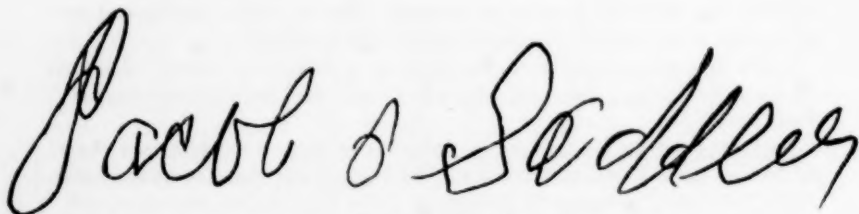
Tongue considerably coated. He projects it without difficulty and has no trouble in keeping it protruded. At times it moves from one corner of the mouth to the other, but only after a considerable interval is it once retracted, immediately put out again and again kept out for some time. He does not close his jaws on his tongue. Has no teeth. Abdominal organs seem about normal; abdomen moderately pendulous.

Right testicle somewhat increased in size, left quite small. Patient thinks it has always been so. Says the right testicle was once injured. Penis small.

As he lies flat on his back in bed, there is an almost constant movement of one or more parts of the body. His head rests upon the pillow, and about the only movement in which his entire head takes part is a moderately frequent lifting of the chin with some consequent movement of the entire head. His eyelids are in almost constant movement. They twitch six or eight times, at first only about half closing, but the movement becomes more and more marked until the lids finally shut tight over the balls for a little time. They then open and this series of movements is repeated. There is considerable lateral movement of the eyeballs, but none anything like so marked as the movements of the lids. He follows the movements of a finger, the eyeball moving with the finger, and the lids following the ball fairly well. While this test is carried out the twitching of the lids is almost stopped. There is an almost constant movement of the lips and cheeks and of the abdominal muscles. The lower part of the chest moves almost as freely. There is also considerable movement in the upper part of the chest, but not nearly so marked as in the lower part. The shoulders are shrugged frequently, and this is about equal on the two sides. The hands and arms are perhaps the most quiet part of his body. At infrequent intervals there is a slight coarse jerking in the arm, but a little more in the left than in the right. Occasionally there is a slight

twitching of the fingers or flexion of the hands on the arms. In the left thigh there is an almost constant tremor in the quadriceps muscle. This is fine, but appreciable both to eye and touch. The same phenomenon is present in the right thigh, but less well marked, and, at times, to a slight degree, in the pectorals. In addition to the tremor, there is a rather frequent coarse contraction of the left quadriceps. This is usually not sufficient to move the leg but often moves the patella upwards. This movement is present in very slight degree in the right thigh. There is no tendency for the quadriceps to remain in contraction when the patella is tapped. In the legs there is practically no movement. Occasionally there is flexion of the left foot on the leg or flexion of the toes of the left foot. Rarely there is slight flexion noted in the toes of the right foot, especially the little toe.

The movements are worse when his attention is called to them, but he can inhibit them to some degree. He ordinarily dresses himself, but does so rather clumsily. Goes walking with other old men who walk a short distance. In starting to perform a voluntary movement, it seems as though he must wait an appreciable interval in order to gather headway to carry it out. The following is a copy of his signature made October 29, 1902.

A handwritten signature in cursive script, reading "Jacob S. Sessler". The letters are fluid and connected, with a large initial 'J' and 'S'.

(JACOB SADDLER.)

There is no great impairment of the muscles of speech, and he articulates quite well. As he sits in his chair there is a frequent movement of the muscles about his mouth, some swaying of his body, and some movement in his legs, but more in the right than in the left. He rises from a chair by assisting himself with his right hand. When first on his feet, he staggers a good deal and sways as if about to fall, but recovers himself and starts off quite rapidly. He raises the left foot very high and brings it down heavily on the floor. There seems less tendency to bring the heel down first than there is in most of the other cases. He frequently brings himself up quickly with a jerk, half stopping, and as he does so, each time he brings the anterior portion of the left foot down first, sliding it along until the heel touches the floor. This movement always involves the left foot. At the examination his temperature is 97.8; pulse, 74; respiration, irregular and difficult to count, but certainly slow. Red corpuscles, 5,012,000; white corpuscles, 6,420.

Mental Condition.—He is always found sitting in a certain chair on the ward. If, in his absence, anyone else gets the chair he promptly ejects him, if able to do so. His face is always covered with a bushy growth of beard, and his eyes, which are deep-set, are bright, and he has a rather shrewd expression. He seems to like a certain fantastic element in his dress. At times he converses readily, and again he will say nothing to anyone. He is always sarcastic and often witty, and when he succeeds in making a joke is much pleased. His conversation is always somewhat fragmentary and incoherent, but this is probably partly, at least, because his thoughts flow more freely than he is able to express them. His orientation as to place is fair, as to persons not so good, and as to time very poor. He gives the year as 1892, then 1891, and finally 1893. Thinks the month is April, and seems to give no attention to the condition of things outside as bearing on this. Says the leafless trees present a peculiar condition, but he has seen it that way before in April. He thinks his memory is just as good as it ever was and excuses any errors in time by saying that he pays no attention to dates. He cannot tell the present President, says he has no reading matter. Recalls the date of the rebellion. At first he cannot name the president at that time, though he evidently has some general recollection of him. After considerable delay, says Lincoln. Says he was married at 32 and has four boys and one girl living; that his movements have existed only two years, and began after a cyclone. He attends well to questions and probably comprehends them, though his answers are by no means always relevant. He continues to be very irritable.

December 30, 1903.—Has failed both mentally and physically since the last note. Is always excited and restless and at times noisy. Frequently quarrels with the other patients and is often disobedient to the attendants. Walks with considerable difficulty. His temperature, pulse, and respiration have recently been taken twice a day for a considerable period and show practically no variation from the normal.

April 12, 1904.—Has a habit of speaking very abruptly and his incoherency is increasing. Sometimes his replies to questions are very bright and sometimes they are silly and not at all to the point. When approached to-day by the physician, the following conversation took place. It is evident that the patient has been thinking some of going out of doors. He starts off as follows: "Take an overcoat, large size, put it on." Q.—"How are you to-day?" A.—"Quite well." Q.—"How old are you?" A.—"Can't tell you, no sir; it is an unreasonable question; don't like that starving; coming up and down; I fell down several times, threw everything around; threw a ground floor clear around; I'll take my chances I guess on clothes (points to torn coat). Look at the buttons! (there are none). I guess they have been eat off. I like coffee best for dinner; a mixed up mess; whatever we get we have to take; don't like to go up and down, up and down; jerk a man head over heels." Q.—"Would you like to see your family?" A.—(laughs) "No I guess I see them about often enough; suit yourself, doctor." Q.—"How many children have you?" A.—

(laughing) "Can't answer that question; that's an unreasonable question (laughs); it don't pay, going up there yesterday something came pretty near killing me; might have been a carpet; dangerous going up there. I like out-door work best; no peace here; I feel well, but when we get pay we got to get up. What's the matter with that fellow (pointing to a general paralytic who is rubbing his knees). (Laughs.) You tell. I guess it is a bossie, it is a breed of folks; got most too many boarders here; you wasn't born to die." Q.—"What were we born for?" A.—"Oh, to do good, do good to our fellow-men, but crowd, crowd, crowd, no chance to go home at all. I would like to be where there is a lounge, lounge." Q.—"What is the date?" A.—"To-day, I can't tell, I can't guess at it, guess Monday (is told it is Tuesday). Well?" (laughs). Q.—"Can you give the month?" A.—"I guess it is about December." Q.—"What year?" A.—"You tell that. There is just as much danger of a man getting killed, those step-ladders." Q.—"Does it seem like December?" A.—(Laughs) "Oh, sometimes, judge for yourself." Q.—"What is this institution?" A.—"I don't know what it is run into, we got to be controlled by the weather." Recently he asked the woman attendants for some cake. When they failed to produce it he slapped them; was put in a side room and broke out the window; was then taken from the room and held until he became quiet. When spoken to about the matter he says: "Don't recollect breaking the window, believe it is a lie; there is not a window in the house, can swear to that. Q.—(Pointing to window) "Are not those windows?" A.—"Name them yourself." Q.—"But I do not see why you say there are no windows in the house." A.—"Be your own judge."

The abruptness of the sentences and the sudden changes do not necessarily indicate such rapid changes of thought. At times there does seem to be a quick change without any cause. When sitting quietly, his movements are not very prominent. There is an occasional slight movement throughout the body, but more marked in the face than elsewhere. The movements in the legs are about equal. The patellar reflexes are much exaggerated.

I saw this man the last time late in 1904. He was still failing and died sometime early in 1905.

CASE NO. XVIII.—Male, age 33, single, farm laborer.

Family History.—This man is the son of the patient described under Case No. XVII. He is the third of six children. At the time of his birth the father was "peculiar," but not noticeably choreic. For further family history see Case No. XVII.

Personal History.—Patient was fairly strong and hearty in childhood. Learned to walk and talk at an early age. Had chicken-pox and whooping-cough in infancy and measles in young manhood, none very severe. At two years of age had a severe attack of bowel trouble which nearly ended fatally. At 10 years of age was thrown from a horse and his clavicle broken; his head also was injured and he was mildly delirious for a few

hours and subsequently could not recall what had happened to him. In the end seemed to fully recover. Began attending school at six or seven and quit at sixteen; did as well there as his brothers and sisters. Never drank or dissipated in any way. No history of convulsions, syphilis, or gonorrhœa. Was sensitive in disposition and quite feminine in his tastes, preferring work in the house to work outside. Was ordinarily cheerful most of the time and quite ingenious and inventive in his tendencies. From 16 to 20 he worked about the farm.

History of Present Illness.—When about 20 he helped to build a stone wall. The work was heavy, and he complained of his inability to do it, but his father forced him to continue. Shortly after this his mother noticed some tendency to jerk his feet about. The patient and mother think that this heavy work may have had something to do with bringing on his trouble. At first he would raise his feet and legs up quickly, like a horse with "stringhalt." A little later it was noticed that he would drop things which he might be carrying, for example, a pail of water. After the appearance of motor symptoms he began to have pain in his arms and occasionally in his feet and legs. The pain distressed him a good deal and his hands and arms swelled considerably. The mother thinks it was rheumatism. It lasted for one month, and then quickly disappeared. On the third day of December, 1897, he was admitted to the hospital. According to the physician's return there had been a gradual weakening of his mental powers for three years. He had become restless and inattentive to his occupation. Did not wish to converse with the members of his family and, though showing no delusions or hallucinations, seemed always apprehensive. He was rather slender, but well developed and well nourished, and his muscles were firm and of good size. Almost his entire body was covered with an eruption of papules and pustules from the continued use of bromides. He had a peculiar twitching movement of the head and limbs which was much worse when he was watched. If left entirely to himself there was noted only a slight movement of the finger and thumb and of the muscles of the neck. He was perfectly oriented as to time and place, recognized he had a nervous trouble and said he had come to the hospital to be treated for it. He remained at the institution until the following June, but there was practically no improvement, and he then went home. On July 2, 1903, he was re-admitted and his mother gave the following history:

Four years ago after a very hard day's work he complained of a pain in his back. He went to bed in the evening, and when he awoke in the morning he was "very insane." After this he was always inclined to run away, and had to be watched constantly. Would remove his clothing. All of that summer he had a good deal of trouble, but was better toward winter, though never nearly so well as before this acute outbreak. Has failed faster since. For one and one-half years has soiled his clothing, and during the last year or two his feet and legs have been somewhat swollen. At the present time his arms, particularly the left, hang loosely at his

sides, and he likes to sit in an arm chair in order to have something to support them. This condition has been noticed during the last year. Last winter he imagined he saw wolves and sheep about the house. Had previously heard his brother speak of wolves catching his sheep. At present rarely speaks and when he does so at all it is usually only a word. For example, in asking for bread he will simply say the word "bread," and not use the entire sentence. He is quite obstinate and was of a rather suspicious disposition at home as long as he was bright enough to show it. He usually sleeps quite well but at times is restless. A little previous to this second admission his mother had written: "He is much worse since he left the hospital, his case is dreadful in the extreme, he is at home and I care for him as best I can. He is quite hearty and is in good flesh, his mind is quite weak, he is helpless, I have to bathe and dress him, and he feeds himself with great difficulty, and drops most of his food on the floor. His bowels move and his urine passes anywhere. His speech is difficult to understand, at times he is quite obstinate and hard to get along with."

The following record was made at his second admission:

Physical Examination.—A tall male, fairly well developed but poorly nourished. Height about 6 feet. Hair very dark and abundant over the head. There is a moderately heavy growth on the body and a moderately heavy moustache and beard. Eyes brown and apparently normal. Vision appears to be good. Forehead moderately broad but seems unusually low on account of the hair growing far down upon it. Right side of head more prominent than left. Eyes deep set and there are dark lines underneath them. Well marked ptosis of lids. Face broad in the region of the cheeks. Nose and lips prominent. Lobe of the right ear adherent. The upper part of the rim of the left ear is more prominent than the right. There are no Darwinian tubercles. Hearing seems to be good.

Skin dark and quite healthy in appearance, but there are numerous scars about the body, probably due to injuries received in falling. Skin of scrotum red and, in places, lacerated. Dermographism moderate on the chest and slight about the extremities. Feet and hands quite well formed. Ridges of the tibiae smooth. Muscles small and flabby. Grip in the right hand registers only five on the dynamometer. The left registers nothing.

As nearly as can be told the heart is normal in size and position, and there are no murmurs. Radial pulse small and weak, and radial arteries a little thickened. No varicosities and circulation in extremities appears to be fair. Chest rather narrow and flat. Percussion resonance normal. It is impossible to make out the breath sounds clearly. The respiratory movement is jerky and much modified by his general movements. Temperature, 98.6; pulse, 78; respiration, 15. The teeth seem fairly well preserved. Abdominal and genito-urinary organs normal.

Pupils equal and normal in size, and react normally for light. They cannot be tested for accommodation. Patellar reflexes both much exaggerated. When the patellar tendon is tapped there is at once a marked

reaction, the extensors bringing the entire extremity into a condition of stiffness. There are then a couple of slight relaxations, and after each one a slight contraction, the quadriceps showing an unusual tendency to remain in contraction. No Babinski. Scratching the skin to produce the cremasteric and abdominal reflexes, produces a marked general movement. It is evident that there is at least a slight cremasteric reflex, but the abdominal cannot be elicited with any certainty on account of the general abdominal contraction. Triceps reflexes are both very well marked. Biceps reflexes are normal.

As he lies flat on his back, it is at once noted that his movements are much more marked in the head and body than the extremities. It is difficult to get him to attempt any movements, but at times he will try to grasp things with his right hand and in so doing the movements seem to be less in that extremity for the time being, but the movements in other parts become much more marked and, in general, any attempt at action seems to make his movements much worse. If an effort is made to move any part of him, as a leg, and it is done very slowly and gently, the leg generally can be moved without difficulty, but if the effort is hurried or much force is employed the muscles seem to at once contract firmly, the extensors more than the flexors, and the limb becomes very rigid for a moment. He lies in bed with his head almost constantly turned to the left and his eyes drawn to the left of their sockets. He is able, however, when requested, to turn his head and eyes to the right. The forehead is frequently wrinkled and the eyebrows are often raised and lowered, the left a little more than the right. There is, occasionally, slight movement in the eyelids, but though watched for a considerable time he does not wink, and his eyes are constantly open. His mouth is closed and there is no movement about the lips or cheeks. The whole head moves occasionally, but it seems to be in response to and dependent upon the frequent movements in the shoulders. He is unable to open his mouth more than a half inch when asked to do so and cannot protrude his tongue at all. When trying to do this, he simply opens and closes his lips slightly and rather rapidly. He cannot keep his head still when trying to drink, swallows with much difficulty and often chokes. As he lies quietly in bed at the time of the examination an occasional gurgle and half choking sound is heard in his throat. There is almost constant movement in his shoulders, something like an exaggerated shrugging, and these movements are about equal on the two sides, first one and then the other, with a sort of rhythmic character. The pectoral muscles can frequently be seen contracting strongly. In addition there is constant movement in the body which also has a rhythmic, twisting character. The greater part of the time there is no movement, whatever, in the lower extremities, except what is communicated from the body; but at times there is a slight contraction of the toes or movement of the foot, and at longer intervals a general, awkward throwing about of the lower limbs. The movements of the toes and foot seem to be a little greater on the

right side than on the left. The upper extremities are about the same as the lower, and seem to have very little movement except that which they receive from the shoulders. No movement is noted in the scrotum except what is communicated to it from the surrounding parts.

Mental Condition.—When first seen he is sitting in a chair on the ward. His expression is not very intelligent and he is in constant motion. He does not speak unless spoken to and even then answers with much difficulty. For instance, when asked his name, he gives a kind of grunt in reply, and after repeated trials does a little better, but still does not speak the name sufficiently plainly to be understood. He seems to know where he is and with much difficulty says something like Independence. After some questioning he either will not answer or else becomes unable to answer any more questions except for an occasional grunt. At the same time it appears that he knows more than his general appearance might indicate. He is fed by the nurse and swallows with much difficulty; is very untidy.

July 25, 1903.—Has been constantly in bed since the last note. His temperature, pulse and respiration are all slightly increased though it is difficult to make sure of the latter on account of his movements. Under excitement, these movements increase greatly. He is rarely found in a sound sleep, but if so he is perfectly quiet. In a light sleep, however, some twitching is constantly present. He is still unable to protrude his tongue, but that may be because his mouth will open only about one-half inch, though he seems to have very little control over the tongue itself. In the evenings his temperature is about 100, but it is at times as high as 102.5. There is no cause made out for this except his rather persistent constipation. This morning he lies with his head to the right, but this is not usually the case.

August 15, 1903.—His temperature now rarely reaches much above normal, and he at times sits up in a chair, but this seems to make his movements worse, and not infrequently they become so severe as to throw him from the chair. Has vomited his food several times lately.

August 20, 1903.—Nearly the entire day he has been in a sound sleep, but when carefully watched there is still noted an occasional twitching of the fingers or shrugging of the shoulders. This is the first time since his admission to the hospital that he has slept so long consecutively, either day or night. He vomits his food frequently, usually throwing it up soon after meals, and sometimes directly after. The food comes up with one violent movement, and there is never any persistent retching or apparent nausea. The food is usually ejected so forcibly as to throw parts of it over the foot of the bed. A hand placed over the epigastrium feels no contraction during the act of vomiting. He always seems very hungry, and will take large quantities of food if permitted.

August 23, 1903.—Vomited very frequently yesterday. At first a watery, then a greenish and finally a brownish material came up. None of it had a bad odor. There is no retching or nausea. Is somewhat better to-day.

August 30, 1903.—He has vomited scarcely any of late and his temperature has been quite near to normal, but the nurse to-day called attention to the cyanotic condition of his hands and feet. At the time of examination they are moderately cyanotic, but the nurse insists that a little time previously they had been almost blue, and this, notwithstanding the fact that he had been lying quietly in bed. At the time of the examination the pulse is slightly accelerated and heart action rather feeble.

September 7, 1903.—He is badly constipated, and his bowels move only with artificial aid. His diet is exclusively liquid, and even then he swallows with difficulty. Almost every day his hands and feet become blue for certain periods of time. His heart at such times acts feebly. Strychnine and digitalis have been used without effect.

October 10, 1903.—Grows constantly thinner and weaker. Has a small sacral bed sore. Vomits occasionally but the food is ejected in a feeble manner. Urine: Clear, pale amber, acid, sp. g. 1031, a faint trace of albumin, no sugar, a good many uric acid crystals and abundant mucous spirals; a very few leucocytes and a good many long rod-shaped bacilli.

October 18, 1903.—He died to-day at 7 P. M. Had grown progressively weaker. He was unusually restless during the latter part of last night, but to-day and especially toward evening has seemed so weak that he moved with difficulty, though his movements have never been absent. Yesterday morning temperature, 98.2; pulse, 76. This morning temperature, 96, and pulse, 62. This evening temperature was 97.8; pulse, 68, and respiration possibly, 40, though the latter was very uncertain.

CASE No. XIX.—Female, age 36, married.

Family History (see Chart I).—The family history goes back to the great grandparents. Their medical condition is not known, but they had two sons and three daughters. Both sons were married and had children, but neither they nor their children had chorea. One of the daughters had chorea, but was never married. The second daughter married and had one daughter. Both developed chorea and died of it, but their descendants cannot be further traced. The third daughter married, developed chorea and died in giving birth to her only child, a daughter. This daughter is the mother of the patient reported. She was married at 17 and remained well until the birth of her third child, when she was twenty-four years of age. She died at 39, and is said to have had chorea in a severe form. Her first child was a boy, who is now a strong and hearty man, and who has four girls and one boy. All are well and all the girls except the youngest are married and have healthy children. The second child was a girl who married at about twenty and continued well until she was twenty-four, when chorea appeared. She died at forty-four. She also had the disease in a severe form, but was not as badly affected as the mother. Her first child, a boy, died at one and one-half years of age of croup. After that she had two daughters born and then a son. All three are living and free from the disease though well along in life. The daughters have never

CHART I.
Great-great-grandfather and mother.

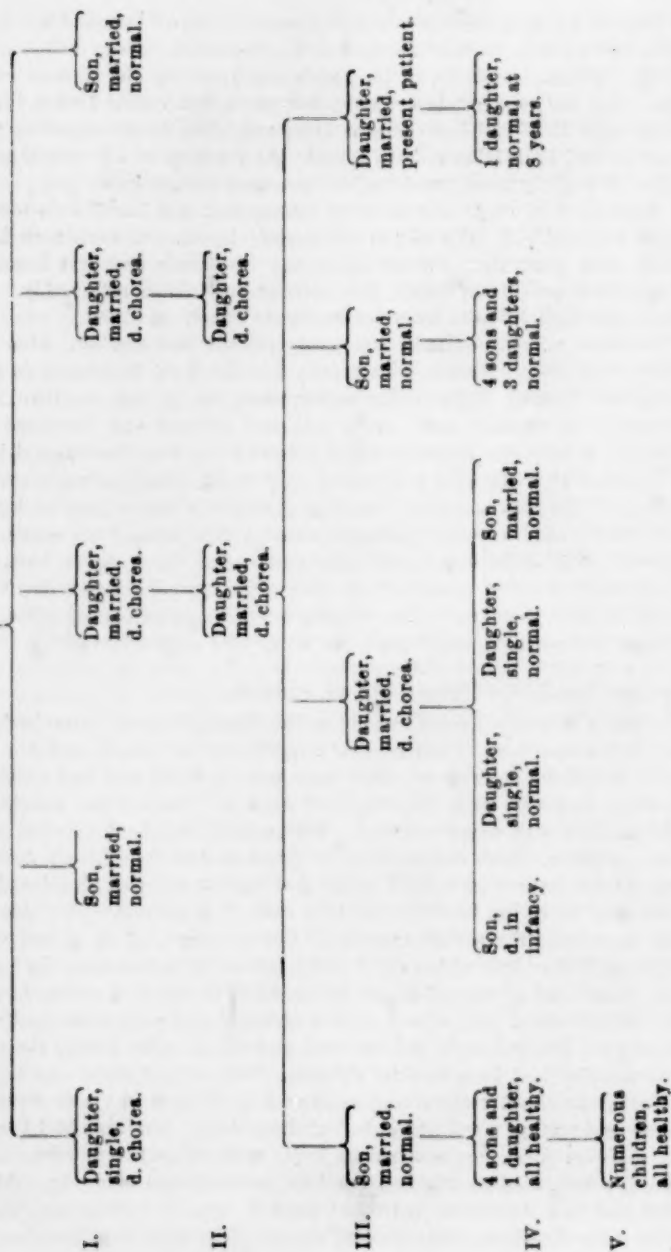




FIG. 5.

FIGS. 5 and 6. CASE No. XIX. Note the awkward, fixed position of the hands, the vacuous smile, and the drooping lids. The movements were very slight in this patient, but the spasticity was marked.



FIG. 6.

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been married or pregnant. The third child was a son who is healthy and the father of four sons and three daughters, all well but not married. The fourth child was a daughter and is the present patient. There is no history of tuberculosis, cancer, excessive use of alcohol or of any nervous or mental disorder in the family except the chorea. The family have noticed particularly that no male, or female descended through a male line, has ever been affected with the disease and that no female, descending through the female line, has escaped the disease except two who have never been married or pregnant and that no female, save one, (one of the original three sisters) has ever had the disease until after marrying and bearing children. It is also an opinion in the family that they "are growing out of the disease," both as to the proportion of the whole number affected and as to the severity of the disease in individual cases, but I can find no confirmation of this in the latter sense. A brother of the patient's father had rickets when a child, is hydrocephalic and since fifteen has had epilepsy.

Personal History.—The patient is a native of the United States and now thirty-six years of age. As a child she was bright and healthy. Learned readily at school and has a common school education. Has worked hard all her life. Was naturally social, neat and industrious. At twenty-six years of age married a laboring man and her life since has not been very pleasant. One year after marriage she miscarried with twins at six months. Later she had a daughter now eight years old and bright and healthy. Has had some pelvic trouble for years.

Present Illness.—Four years ago her husband noticed that she had some difficulty in walking. A year later he noticed a jerking of her shoulders and body, particularly when she was tired. After this there appeared some difficulty in speech and in the movement of her arms and some stiffness of the fingers. She gradually grew worse but was able to do her household work until committed to the state hospital for the insane, May 9, 1902. For two or three months previously she had been somewhat forgetful; would begin to do a thing and forget what she wished to do. Her memory for remote events seemed much better than for those of recent occurrence. When admitted she was found in fairly good physical condition; height, 5 feet, 6 inches, weight 125 pounds. The face was asymmetrical. The hands were cold to the touch and were distinctly cyanotic. Chest examination negative. Tendon reflexes all exaggerated but pupillary reflexes normal. Urine negative. There was a right sided perineal and a bilateral cervical tear. Uterus anteфлекed. The irregular, jerky movements were widespread and almost constant during her waking hours. In general her movements were slow but when walking, after once getting started, she moved rather rapidly. At such times her feet were kept wide apart and all her muscles were in a state of more or less rigid contraction. There was no movement or tremor when asleep. She was well oriented but her memory and intellect were only fair. There was no special irritability. The matter that interested her most and of which she talked most

was getting well and going home. On June 10, 1902, I had an opportunity to make the following examination:

Physical Examination.—She is a rather large female, quite well developed and fairly well nourished; hair dark brown and not very abundant; eyes gray. Vision does not seem to be very good. When given a newspaper she reads only the larger type, but it is difficult to tell whether this is due to poor vision or to her mental condition. Ptosis is very well marked (see Figs. V and VI).

Forehead not very broad or high. Cheek bones rather prominent, the right more so than the left, and the chin seems to turn a little to the left, giving the face an unequal appearance. Both ears stand out quite prominently from the head and there is a well marked Darwinian tubercle in the left. Aside from this they are normal in appearance. When tested with a watch her hearing seems to be good but judged from her ability to understand conversation it is decidedly impaired.

Skin fairly healthy in appearance. Muscles small. Grip in the right hand $7\frac{1}{2}$ and in the left 15, measured by the manometer. At a second trial the results are the same in both hands. The little fingers tend to stand out prominently from the others, as seen in Figs. V and VI. The ridges of the tibiae are smooth.

Temporal arteries not visible or palpable. Radial arteries quite leathery; pulse, 73, regular but not very full or strong. Apex beat of the heart very prominent in the fifth interspace and a trifle outside the midclavicular line. Upper border of heart dulness at the upper border of the third interspace and right border of heart dulness at the left border of the sternum. Heart sounds about normal. Her hands continue very red throughout the entire examination and the color does not readily return when pressure is made locally. The feet, up to the ankles, are also red but not to the same degree as the hands. The attendant has noticed that her hands and wrists not infrequently become blue and this is particularly true when out walking.

Chest fairly well developed. The lungs appear to be normal. As she lies in bed the respiratory movement is regular and slow and the excursions slight.

Urine.—Clear, amber colored, acid, sp. g. 1030, no albumin, no sugar; a few leucocytes and some epithelial cells and granular debris.

Pupils normal in size, equal and react normally for light and rather faintly for distance. Both eyes quite prominent and the balls partake to a limited degree in the choreiform movements. Patellar reflexes both much increased, but no ankle clonus. Achilles jerks very marked. When an attempt is made to test for the Romberg sign she cannot put her feet within six inches of each other and even at that distance cannot stand without assistance. Cannot walk a crack. No Babinski. Biceps and triceps reflexes increased in both arms. She cannot protrude her tongue, and says she cannot raise the angles of her mouth. She makes a great effort to do both these things, but it seems as if she could not bring the

necessary muscles into action, even to the slightest degree. When asked to shut her eyes closely she does so quite loosely and when told to open them, does so slowly. She has a good deal of trouble in touching the end of her nose with the index finger and more with the left hand than with the right though she says the left is the better of the two. It is almost impossible for her to touch the lobes of her ears with the hands crossed. She sits down in a chair slowly and with considerable hesitation and rigidity, but does not grip the chair with her hands to assist her. She holds her head up but her eyes are about two-thirds closed the greater part of the time. The eyelids rise and drop at short intervals, but the movement is rather slow. The movements seem a little more marked in the right eyelid than in the left. There is an occasional slight elevation of the brows.

At the time of the examination her hands are clasped in her lap in a rather awkward way. There is very little movement seen anywhere in the body, but ordinarily as she sits about the ward there is a more or less general slight movement of the head and body but not of the extremities. When she talks the movement in the eyelids and the raising of the eyebrows becomes very marked. In smiling, her face is drawn mostly to the right. She rises from a chair without much difficulty and without catching it with her hands. She takes considerable pride in the way she walks and explains that it is not better because she has corns and they hurt her. Each step is very short and about of equal length with the two feet, but the foot is raised higher than usual, and as she lifts either foot her body sways forward, one side and then the other, alternately. The body seems to be in a very rigid attitude when she walks and if an attempt is made to hurry her, or to turn or move her quickly in any new direction, her body is at once thrown into an extremely rigid condition and she resists the movement in every way. It is doubtful whether this is wholly voluntary, but she says it is because she fears that she will fall and tries to save herself in this manner. This, however, only after the explanation has been suggested to her. She does not look down in walking as much as one usually does but keeps her eyes partially closed and fixed at a point some distance in advance. She not infrequently falls and always forward. This occurs more frequently on the ward than elsewhere, which is probably because she is there walking only short distances. When once she gets well started she can walk for a considerable time without any apparent tendency to fall. Her greatest trouble is always just as she starts when there is a tendency for her body to move faster than her feet and thus she falls forward. It is noticed that there is some tendency to walk on the forward part of her feet with a peculiar jerky spring. As she walks the right arm is flexed at the elbow nearly to a right angle and is held against the side. The left arm is also flexed and to some degree, but it is held out from the body and the fingers are separated and held in a peculiar attitude. At times the right hand is closed quite firmly and at times the fingers are extended. When sitting, also, the arm and hands are often pretty much in this relative position but not infrequently the

hands are crossed in the lap; the fingers of the left, however, still more or less spread out. When placed in bed she lies very quietly and there is absolutely no movement anywhere except a little twitching of the eyelids and a little raising of the brows. Most of the time her eyes are fixed on the ceiling in a vacant stare.

She always speaks slowly as if she had trouble in enunciation, and in so doing her mouth draws up more to the right than to the left. Her speech is indistinct and her words are not sharply cut off—are indeed, like those of a drunken man.

Mental Condition.—On superficial observation she would seem to be very much demented but when carefully studied this is found to be, to a certain degree, incorrect. Concerning many points her memory is good, for others it is fair. Thus she seems to remember perfectly well all her husband's visits, and tells in detail when he came and how long he remained each time. She says, however, her movements began a year ago last spring. As nearly as can be determined she now has no delusions concerning her husband. Says she had two children born dead and had one miscarriage. Her living child was born before any of the others.

Her husband writes to her regularly twice per week. She is always greatly pleased to receive letters but when they come it requires considerable time for her to open them as her fingers seem to act very slowly. She always reads and writes slowly so that it usually requires an entire day of almost constant writing to complete a short letter to her husband. As she writes, there is seen a well-marked tremor in the hand which is writing but not of other parts of the body. Each character is formed very slowly and with much labor.

She eats very rapidly, takes large quantities of food and at times chokes. The attendants think this is due more to her rapid eating and insufficient chewing than to any actual incapacity to swallow. There is no loss of control over the sphincters and she is not absolutely filthy but she is very untidy.

June 20, 1904.—When questioned about the matter she admits that she is physically ill but does not think she shows any mental disturbance. Is usually cheerful and pleasant and thinks she is improving. She usually has a smile but her expression is somewhat drawn and mask-like. A few days ago told her physician that she was greatly worried because the nurse had broken a tube off in her. This doubtless referred to taking her temperature by rectum. Also told the nurse that someone had broken part of her womb off. Recently, not receiving a reply to one of her letters sufficiently quickly, she decided that a nurse had caused some trouble between herself and husband. She frequently asks to go home and when speaking of home usually weeps.

August 15, 1902.—Is growing more demented, writes frequent letters, and takes a long time to write each one. Says she cannot write when others are looking at her. All her muscles are held very rigid as she writes. Frequently cries because she cannot go home.

September 25, 1902.—No improvement. Eats and sleeps well. Pupils equal and reaction normal. Tendon reflexes exaggerated. She stands, walks and works in a stiff strained manner. During sound sleep there is no tremor or jerking of any kind. She stands fairly well if her feet are wide apart, but after standing several minutes is more unsteady than at first. Walks almost as well with eyes closed as open. Requires two minutes in which to write her name.

Getty Shuffelberger

(GETTY SHUFFELBERGER.)

This is much better than her usual signature. The longer she writes the more illegible her writing becomes.

September 16, 1903.—There has been no important change in her condition except a slow deterioration, both mentally and physically. Her choreiform movements do not seem worse but she has more difficulty in getting about and not infrequently falls. Often, however, asks if she is not getting better and evidently thinks she is. Is quite fond of good things to eat and continues well nourished. The attendant says she is always hungry. Last night induced another patient to wash her feet in a vessel of urine. To-day can see nothing improper in that act. Does not work except to make her own bed and this is a long and difficult task for her. Is usually cheerful in a childish kind of way.

November 19, 1903.—Is failing more rapidly of late. Walks with great difficulty, speaks very low and articulates with much difficulty. Still has an extraordinary appetite, and eats in a very offensive way, frequently choking. This latter is doubtless due as much to hurried eating of excessive quantities as to defective muscular control.

February 29, 1904.—Continues to fail, though slowly. Is more pale than she was and is less inclined to talk. Articulates very indistinctly and moves about the ward with great difficulty. The choreic movements and the reflexes continue much the same.

In April 1906, this patient was reported as still alive but very much demented and scarcely able to move about.

CASE NO. XX.—Female, age 69, married, housework.

Family History.—The father and mother died in advanced life. It is not known that they were choreic. The patient had at least one sister who died at about 80 of chorea. She had had the trouble for years and had frequent periods when she would become angry and sulk for two or three days so that her family could do nothing with her. She has seven living children but none have the movements so far as known. The patient has

hands are crossed in the lap; the fingers of the left, however, still more or less spread out. When placed in bed she lies very quietly and there is absolutely no movement anywhere except a little twitching of the eyelids and a little raising of the brows. Most of the time her eyes are fixed on the ceiling in a vacant stare.

She always speaks slowly as if she had trouble in enunciation, and in so doing her mouth draws up more to the right than to the left. Her speech is indistinct and her words are not sharply cut off—are indeed, like those of a drunken man.

Mental Condition.—On superficial observation she would seem to be very much demented but when carefully studied this is found to be, to a certain degree, incorrect. Concerning many points her memory is good, for others it is fair. Thus she seems to remember perfectly well all her husband's visits, and tells in detail when he came and how long he remained each time. She says, however, her movements began a year ago last spring. As nearly as can be determined she now has no delusions concerning her husband. Says she had two children born dead and had one miscarriage. Her living child was born before any of the others.

Her husband writes to her regularly twice per week. She is always greatly pleased to receive letters but when they come it requires considerable time for her to open them as her fingers seem to act very slowly. She always reads and writes slowly so that it usually requires an entire day of almost constant writing to complete a short letter to her husband. As she writes, there is seen a well-marked tremor in the hand which is writing but not of other parts of the body. Each character is formed very slowly and with much labor.

She eats very rapidly, takes large quantities of food and at times chokes. The attendants think this is due more to her rapid eating and insufficient chewing than to any actual incapacity to swallow. There is no loss of control over the sphincters and she is not absolutely filthy but she is very untidy.

June 20, 1904.—When questioned about the matter she admits that she is physically ill but does not think she shows any mental disturbance. Is usually cheerful and pleasant and thinks she is improving. She usually has a smile but her expression is somewhat drawn and mask-like. A few days ago told her physician that she was greatly worried because the nurse had broken a tube off in her. This doubtless referred to taking her temperature by rectum. Also told the nurse that someone had broken part of her womb off. Recently, not receiving a reply to one of her letters sufficiently quickly, she decided that a nurse had caused some trouble between herself and husband. She frequently asks to go home and when speaking of home usually weeps.

August 15, 1902.—Is growing more demented, writes frequent letters, and takes a long time to write each one. Says she cannot write when others are looking at her. All her muscles are held very rigid as she writes. Frequently cries because she cannot go home.

September 25, 1902.—No improvement. Eats and sleeps well. Pupils equal and reaction normal. Tendon reflexes exaggerated. She stands, walks and works in a stiff strained manner. During sound sleep there is no tremor or jerking of any kind. She stands fairly well if her feet are wide apart, but after standing several minutes is more unsteady than at first. Walks almost as well with eyes closed as open. Requires two minutes in which to write her name.

Getty Shuffelberger

(GETTY SHUFFELBERGER.)

This is much better than her usual signature. The longer she writes the more illegible her writing becomes.

September 16, 1903.—There has been no important change in her condition except a slow deterioration, both mentally and physically. Her choreiform movements do not seem worse but she has more difficulty in getting about and not infrequently falls. Often, however, asks if she is not getting better and evidently thinks she is. Is quite fond of good things to eat and continues well nourished. The attendant says she is always hungry. Last night induced another patient to wash her feet in a vessel of urine. To-day can see nothing improper in that act. Does not work except to make her own bed and this is a long and difficult task for her. Is usually cheerful in a childish kind of way.

November 19, 1903.—Is failing more rapidly of late. Walks with great difficulty, speaks very low and articulates with much difficulty. Still has an extraordinary appetite, and eats in a very offensive way, frequently choking. This latter is doubtless due as much to hurried eating of excessive quantities as to defective muscular control.

February 29, 1904.—Continues to fail, though slowly. Is more pale than she was and is less inclined to talk. Articulates very indistinctly and moves about the ward with great difficulty. The choreic movements and the reflexes continue much the same.

In April 1906, this patient was reported as still alive but very much demented and scarcely able to move about.

CASE NO. XX.—Female, age 69, married, housework.

Family History.—The father and mother died in advanced life. It is not known that they were choreic. The patient had at least one sister who died at about 80 of chorea. She had had the trouble for years and had frequent periods when she would become angry and sulk for two or three days so that her family could do nothing with her. She has seven living children but none have the movements so far as known. The patient has

one daughter, 28 years old and married, and one son, 27 years old and single. Both are nervous but the daughter is not choreic. The son shows a frequent elevation of the brows and shrugging of the shoulders, probably choreic.

Personal History and Present Illness.—Nothing is known as to her early life. She is thought to have had good general health and has always worked hard. About ten years ago her son first noticed that she had peculiar movements which have gradually grown more marked since. At about the same time her mind became affected. She would become excessively angry for slight cause, tear her clothes and throw articles about the room. Was always suspicious and thought she was discriminated against in many ways. Her memory also grew gradually weaker. Her ordinary weight was about 130 pounds, but she has fallen off greatly in the last year.

Physical Examination.—She is a medium sized female, fairly well developed but very poorly nourished. Right side of head more prominent than left. Otherwise head and face normal. Ears normal in shape and hearing good. With the aid of glasses she reads fairly well. Her skin is dry and very dark—almost bronzed—in color. The patient and her son unite in saying that this discoloration of the skin has appeared in late years and has gradually grown worse. Muscles small.

Her heart and lungs are examined with difficulty on account of her excessive movements. The lungs appear to be normal. The heart sounds are sharp but the area is normal and there are no murmurs. The radial and temporal arteries are soft, considering her age. The abdominal organs appear to be healthy.

The pupils are equal and normal in size and react normally for light and distance. The eyeballs have slight jerky movements in irregular directions. At the time of the examination she is in bed with a fracture of the left thigh and the left patellar reflex cannot be determined. The right is slightly diminished. The biceps and triceps reflexes are moderately increased. The Babinski phenomenon is uncertain on account of the choreiform manifestations, but probably not present. She closes both eyes at the same time, normally, but cannot close either separately. Cannot raise the angles of her mouth. She protrudes her tongue straight to the front but it is almost immediately pushed to the left, and this happens constantly when the test is carried out several times. With eyes closed she touches the tip of her nose with either forefinger but only after her hands have gone through varied waving movements. She cannot or will not follow a finger with her eyes but the lids follow the eyeballs normally. Her grip is a little better in the left hand than in the right, but poor in both.

Choreiform movements are very marked throughout her body and seem about equal on the two sides, except in the case of the lower extremities. They are present in the face, head, neck, arms, chest, abdomen, and legs. The muscles are all in a slightly spastic condition, and there is slight equino-

varus. The fingers and toes are generally hyper-extended, at times contracted. She can scarcely control her hands sufficiently to arrange the bed-clothes, and in doing so her movements become very marked. The movements are very much less in the broken limb than in the opposite, and strange to say, do not appear to have materially interfered with healing. There is some difficulty in articulation and, in particular, it seems as if only after a distinct effort can she overcome a certain inertia or spasticity of the muscles. She is able to control the movements to only a limited degree.

Mental Condition.—When first seen she is lying in bed. Her eyes are half closed and she has a sleepy expression. Her movements increase as soon as she begins to speak. She talks almost constantly during the course of the physical examination, and always about her wrongs. Tells how she was mistreated by her last caretaker and how her leg was broken in attempting to escape from the place. Says she was being starved, and that she would have been killed if she had remained much longer. She recognizes her surroundings and remembers the faces of those whom she sees only occasionally but she cannot tell the date or the street address of her son or daughter. Says that Grover Cleveland is the president and that McKinley preceded him. Gives the year as 1900 and something, and the month as June, but only after a long interval. Cannot tell the day of the month. She thinks her memory is good at times and at times somewhat impaired. When questions are asked she will often say "you just let me think," and will lie for a long time as if in deep thought, but rarely answers the question unless it is repeated. When given, her answers are fairly relevant. The nurses describe her as very difficult to get along with and say that she wants a great variety of things and always wants them without any delay. Even if her wants are supplied she still thinks she is being misused.

CASE No. XXI.—Female, age 40, married, housework.

Family History.—Her paternal grandfather, father, and one sister had chorea and died insane. A brother is living and so far as known is not choreic. The patient had eleven children, but two sons and four daughters are all that are now living. The cause of death of the others is not known. Of those living at least one son (Case No. XXIV), and two daughters (Case Nos. XXII and XXIII) are affected. The other three, I have not been able to see and the statements as to their condition are not reliable.

Clinical History.—The record obtainable is very meagre. The patient was born in Norway. Her trouble was first noticed when she was thirty-three years of age. Mental disturbances appeared at about the same time as the choreiform movements. She was not suicidal. When admitted at the State Hospital, September 3, 1879, she was much demented and could not speak although she appeared to understand something of what was said to her. She was anaemic and emaciated and had well marked chorei-

form movements of head and upper extremities. Two months after admission she died, the cause not being stated.

CASE NO. XXII.—Female, age 42, married, housework.

Family History.—The family history is given in Case No. XXI, except that the father died from an accident at 64 and was not choreic.

Clinical History.—She is the third child of the patient described under Case No. XXI, and is married but has no children. Is now 42 years old. She is moderately well developed but is anaemic and not very well nourished. Her expression is fairly bright but there is some tendency to drooping of the eyelids, and she has a rather sleepy appearance. She is slow in answering questions and has slight choreiform movements over practically the entire body, but most marked in the thumbs and adjacent fingers. The movements increase with embarrassment. There is no disturbance of gait. She evidently has no idea that she is choreic, is quite sensitive when the matter is mentioned and declines an examination.

CASE NO. XXIII.—Female, age 35, married, housework.

Family History.—Given in Cases No. XXI and XXII.

Personal History.—The patient is the fifth child of the patient described under Case No. XXI. She had ordinarily good health in childhood. Has never had any serious injury or ailment. Was married at twenty-four and has had three children. All her labors were easy. Her first child weighed only two pounds at birth and has been delicate ever since. Two weeks before the birth of the second child she was much frightened by an alarm of fire. A little after her labor, choreiform manifestations were noted, and have gradually grown worse since. A variety of treatment has been of no assistance to her. At one time her feet swelled considerably but this is not true at the time of the present examination. When in good health she weighed about 120 pounds.

Physical Examination.—The patient is a tall, anaemic female, very poorly nourished and only fairly well developed; weight, 96 pounds; hair very light and rather thin; eyes blue; moderate chronic conjunctivities. She says her vision has failed considerably of late. Her eyes follow the movement of a finger and the lids move normally with the eyeballs. The mucous membranes are pale. Her forehead is rather low and narrow. Face very narrow. Ears large at the top and small at the bottom; lobes adherent. There is a well-marked Darwinian tubercle in the right but none in the left. She says her hearing is poor but an examination with a watch reveals nothing abnormal.

Muscles small and flabby, grip poor but about equal in the two hands.

Pupils equal and react normally to light and distance. Patellar, biceps, triceps and Achilles reflexes all exaggerated. No Romberg or ankle clonus.

Chest moderately well developed. Lung examination negative except that the respiratory movement is jerky and choreiform in character. Area of heart dulness slightly enlarged to left. Sounds weak. The radial and temporal arteries not thickened. Pulse regular but small and weak.

Teeth not well formed, many absent. Tongue clean, very slightly tremulous.

As she sits in her chair, slight, constant movements are observed. They are somewhat jerky yet rather slow and affect the head, neck, trunk, and extremities. She can inhibit them to a limited degree.

Mental Condition.—She sits with eyes half closed and has a stupid, sleepy expression. Her dress is carelessly arranged. She is very slow in comprehension and when asked a question always says, "What?" but if the question is not repeated she eventually answers it more or less satisfactorily. She is disinclined to talk and says nothing unless spoken to. There is no disorientation as to place and surroundings, but she gives dates very incorrectly and intellect and memory are both much impaired. So far as can be seen she has no comprehension of her real situation, insists that she is "only nervous" and she is "better now." She does not seem to realize that she is in almost constant movement and apparently has no idea that she is afflicted with an incurable, hereditary disease. There are no hallucinations or delusions.

CASE No. XXIV.—Male, age 39, single, farmer.

Family History.—Given in Cases No. XXI and XXII.

Personal History.—The patient is the fourth child of the patient described under Case No. XXI. He cannot recall having had any of the diseases of childhood. Has never had rheumatism. His present trouble began ten years ago after a severe attack of typhoid fever and a bad fright incident to the burning of his house. The disease came on very slowly, but is gradually progressing. He has lost some in weight. Has done no work for some time and is now at the County Poor Farm. A few months before I saw this man he had been under the care of a physician who assured him that his disease was not hereditary and was wholly the result of an elongated and adherent foreskin. An operation was performed, but of course without improvement.

Physical Examination.—The patient is a medium-sized male; moderately well-developed and fairly well nourished. Eyes blue, vision good. Complexion medium; hair light brown. Nothing unusual noted in the formation of head or face. His ears are large at the top and small at the bottom. They stand out prominently from the head and both have well-marked Darwinian tubercles.

Skin healthy. Muscles rather small and not very firm. Grip in the hands is much impaired and is equal on the two sides.

The pupils are equal and react equally, but sluggishly, to light. The patellar, achilles, biceps, and triceps reflexes are all considerably increased. There is no ankle or patellar clonus. Chest well developed. Apex of right lung a little less resonant than left, but nothing else of importance noted except that the breath sounds are quite irregular. Heart normal in area, but the sounds are not quite regular. At frequent intervals they are accelerated, and these times seem to correspond with the

greatest severity of the movements. Pulse fairly full and strong. Radial arteries distinctly leathery.

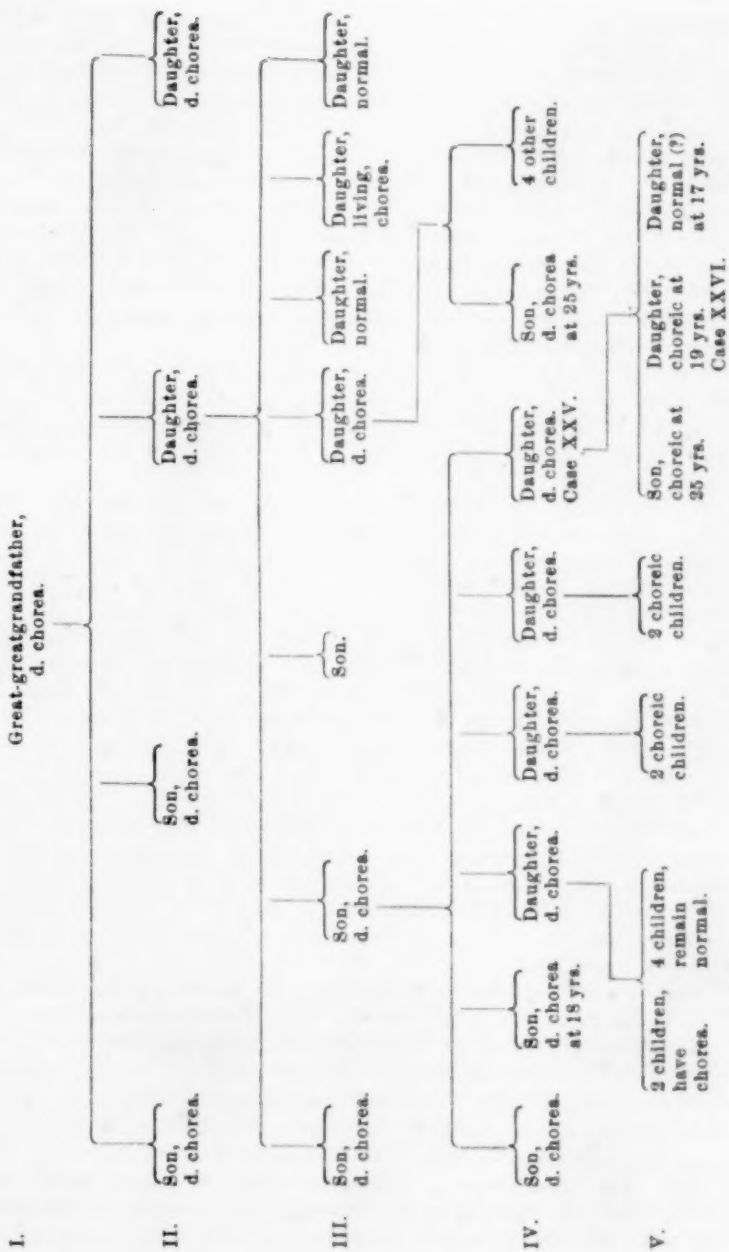
As he sits in a chair he is in constant motion. His head keeps up a continuous slow nodding and, in addition, there is some tendency to a circular movement. His eyelids participate slightly in the movement, but not the eyeballs or brow. He constantly opens and shuts his mouth and at times protrudes the lower jaw and lip. He protrudes his tongue with a little difficulty and jerks it back into the mouth several times within a short period. Articulates poorly. Even the simplest words are spoken indistinctly. The shoulders are shrugged at frequent intervals, the left more often than the right. His fingers keep up a constant movement, consisting chiefly in approximation of the thumb and fingers, but at times in extension or hyper-extension of the fingers. The movement is slight in the feet and legs, but a little more in the right than in the left. The pectoral muscles take part to a limited degree in the movement, the abdominal muscles to a greater extent. He walks rather slowly and with a hesitating, swaying movement. Rises on one foot, sways slightly and hesitates before taking another step. All his movements are increased as he attempts to walk. He buttons his clothes with some difficulty.

Mental Condition.—When first seen he is sitting in a chair, quiet except for his choreiform manifestations. He is slouchy in his dress, but not untidy. His face has a somewhat sleepy look, and he evidently does not care much to enter into conversation though he answers questions when they are asked him. He does not think there is anything wrong with his mind except that his memory is impaired. When asked the date, he fixes it at 1894 (in reality 1904) after a good deal of consideration. The month he gives correctly, but cannot recall the day of the month. Names the governor, but cannot name the president or the preceding president. Is oriented as to place and surroundings. Says: 8×9 are 36, 4×6 are 28, 2×8 are 16; all with some hesitancy. When asked to say his alphabet he does it in the same hesitating manner. It seems difficult to start, but as soon as he gets control of one letter he rapidly pronounces four or five others in proper sequence, but so closely that they can scarcely be differentiated. Then he will hesitate on another letter, hold it for a moment and rush on to others just as before. There are no delusions of persecution or signs of undue irritability. He likes his position at the County Poor Farm and thinks he is well treated. Eats excessively, but does not complain of his food. Is less demented than he appears on superficial observation.

CASE No. XXV.—Female, age 38, married, housework.

Family History.—(See Chart II.) The family history is seen in the appended chart. The investigation was carried as far as possible, but in several instances only a partial history could be obtained and there were doubtless some cases of chorea in the family which are not here recorded. As far as is known, mental disturbance was present in all of those who

CHART II.

Great-greatgrandfather,
d. chorea.

developed the disease. The father of the patient burned his brother-in-law's barn in revenge for some fancied wrong, was put in jail and hanged himself while there. The patient was the youngest of six children and the last to become choreic. One year after marriage she gave birth to a boy who is now twenty-five years old. His father thinks he shows the early mental symptoms of chorea as well as fairly well-marked twitching of the muscles. The next child, a girl, was born six years later. She is described under Case No. XXVI. The third child, a girl, now seventeen years old, is in good general health and I have never been able to make out any choreiform manifestations in her case, though her father insists that during the last two years she has grown much more restless and dissatisfied with her condition. He also thinks that at times she shows a faint twitching of the muscles.

Personal History.—So far as the husband knows, his wife was well in early life. She had no severe illness or injury and there is no history of rheumatism. She did well in school and later was always considered bright, truthful, modest, and unusually neat in her work. She was married at twenty-six.

Present Illness.—At the time of her marriage and for some time afterward the patient was generally considered perfectly well, but as her husband now looks back he thinks that even at that time there was some change in her mental condition. She was less neat in her work, less modest in her demeanor and conversation, and much more inclined to spend her time visiting and gossiping with the neighbors. Five years after marriage her husband first noticed a twitching in the muscles of the mouth. Next the arms and shoulders were affected and finally all parts of the body. At the time the movements were first observed there had developed a quite marked mental change. She grew more slovenly in dress and work, more coarse in speech and more untruthful. She never seemed to realize that she had any physical or mental ailment. Was always eager to work and tried to continue at it long after she could really accomplish anything. Her sensibility to pain was very greatly diminished and though in her awkward attempts at work she often injured herself she showed no sign of appreciating it. Thus in operating the sewing machine she often ran the needle through her finger, but never seemed to mind this.

On June 19, 1894, when 38 years of age, she was sent to the State hospital, at St. Peter, Minn., and for the record of her condition from that time on I am indebted to the superintendent, Dr. H. A. Tomlinson.

"When admitted the patient was in good physical condition, but very much depressed mentally. The motor disturbance showed itself in a series of involuntary spastic movements, involving the trunk, upper extremities, and facial muscles, with loss of co-ordination, most marked in the left arm and leg. She sways in walking, and there is marked spasm with rigidity when she starts to walk. When started the walk extends into a run, to be followed by a more or less abrupt stop, with swaying of the

body and gyrations of the arms, until the spasm is again overcome. As long as the patient was in the hospital there was no other mental disturbance than the discomfort resulting from her morbid self-consciousness. However, on two occasions, when she was sent home, the outbreaks of violence toward her family began in a short time, and she had to be returned to the hospital. The extreme irritability showed itself in an incident which occurred at the time of her return from one of these visits home. As she was getting ready to go with the nurse a house cat got in her way, when she stopped quickly, grasped it by the head, and wrung its neck. Then throwing it violently away from her she walked on apparently unconscious of what she had done. The violence toward her children was manifested in the same way, although not so extremely, and was apparently as impersonal. None of these outbreaks ever took place in the presence of strangers, however, or towards adults; but, on the contrary, when crossed by her husband she always threatened suicide.

After her last return to the hospital she grew more demented; the motor disturbance became more and more marked, and she was constantly depressed. At times the movements were so violent as to throw her on the floor, or against objects in the room. In 1900 she began to be careless and untidy, and also lost in weight. The movements became more marked, and the disturbance also affected her speech, so that it was very difficult to understand what she said. In April, 1902, she began to complain of weakness, also of headache, and pain in the back. She soon became so feeble as to have to be put in bed, but the movements were so extreme that it was necessary to fasten her to keep her from throwing herself out of bed. She developed an abscess in a bruise on the left arm, and there followed general intoxication which involved the kidneys. She became progressively weaker; the bowels and bladder were emptied involuntarily; there was a very large amount of pus discharged from the abscess cavity, and the temperature varied from 101° to 104°. On April 22, she became stupid; the lungs filled up gradually, and she died on April 24, 1902."

CASE NO. XXVI.—Female, age 19, single, housework.

Family History.—This patient is the second child of the woman described under Case XXV.

Personal History.—There was no special trouble at labor. She was a breast-fed, healthy infant. Had measles, whooping cough, and scarlatina, but was not seriously ill until two years ago when she had a severe attack of typhoid fever and after that appendicitis for which she had an operation. No rheumatism. No injury. Has had attacks of eczema each winter for several years. Began school at five or six and quit at fourteen. Did fairly well. Was quiet, truthful, cheerful, and neat. For the past four years has been doing housework at home and at first did it quite well.

Present Illness.—A little more than two years ago she began losing interest in her work at home. She was less neat, but this was more

noticeable in her work than in her dress and person. Often she would leave her work undone and go to the neighbors' to talk. Did not seem to have any sense of responsibility. Was continually putting things off. This condition of affairs has gradually grown more marked. Now she will sit in a chair for considerable periods as if lost in thought. She is much less careful about the accuracy of her statements than previously, though there seems to be no real intent to deceive.

Physical Examination.—She is a medium-sized young woman, well-developed and well-nourished. Eyes brown, complexion olive; hair dark. Muscles fairly large and firm. Mucous membranes normally pink. No eruption or scars of any importance. No asymmetry of face or head. Palate high. Ears normal except for a Darwinian tubercle in the left. Chest well-developed, and heart and lungs entirely normal. Radial and temporal arteries soft. Pulse full, strong and regular; rate 74. No varicosities. Teeth normal; tongue clean. Abdominal organs entirely normal, no hæmorrhoids. Urine: clear, amber, acid, sp. g. 1024, no albumin or sugar. Microscopic examination negative. No vaginal examination made. Menstruation began at fourteen, regular, painful during first day.

She complains of being easily tired and says that for one year she has never been free from a certain feeling of lassitude. There is no vertigo and no pain except at the menstrual period. Her expression is usually a little dull and her eyelids droop a little. No nystagmus, strabismus or other abnormality of the eye. She sees well and does not use glasses. Hearing, smell, and taste normal. No disturbance of sensibility for touch, pain, heat, or cold. Vaso-motor condition normal. Patellar, Achilles, biceps, triceps, plantar, abdominal, and corneal reflexes all normal. No Babinski or Romberg. The motor functions are all good except for an occasional slight, apparently involuntary, movement about the eyes, forehead, and shoulder. No disturbance of speech except that at times she is a little slow in starting her words.

Mental Condition.—When seen at the office and in her home on different occasions she is neatly dressed and there is nothing peculiar noted in her attitude, either at rest or in motion, except the movements mentioned above. She evidently is not much given to talking, but she speaks intelligently and her mental condition seems good. Her expression is at times rather sad and she is certainly less animated than one would expect in a girl of her age. Her father states that she always sleeps³ an

³ Since this article was placed in the hands of the printer, I have seen five more cases of chronic progressive chorea—three of them being patients of Dr. W. A. Jones and two my own. Two of these individuals presented themselves on account of insomnia, and one of the two declared that she had never noticed anything wrong except the insomnia, though her movements were quite marked. In again going over the cases here reported it has occurred to me that I have failed to call sufficient attention to this symptom. There is some reference to it in the notes on a few individual

unusual number of hours, as does also her sister, that she is very slow in accomplishing anything and is easily tired.

CASE NO. XXVII.—Female, age 52, married, housework.

Family History.—Family record not complete. The father and mother are dead, but it is stated that neither had chorea. The patient has two brothers and three sisters living who also are said not to have chorea, but one of the sisters when seen is found to have distinct choreiform movements in the hands and shoulders.

Personal History.—Personal history also difficult to secure. She appears to have had good general health. No record of a severe illness at any time. Married life extremely unhappy. No children.

Present Illness.—She has had well-marked choreiform movements for many years. The duration of her mental trouble is quite uncertain, as her relatives do not yet recognize its existence.

Physical Examination.—She is a medium-sized woman, fairly well developed, but poorly nourished. The muscles are small and flabby and her skin is wrinkled and rough; mucous membranes pale. Temp. 98.4; pulse 78, regular and fairly strong. The chest examination is quite negative except that the respiratory movements are irregular and partake of the choreiform manifestations. Radial and temporal arteries a little more thickened than is normal at her age. No varicosities. It is not possible to make an examination of the blood or urine. Vision and hearing good. No arcus senilis, nystagmus, or strabismus. Her pupils are equal and normal in size and react normally for light and distance. She states that smell and taste are normal. Sensibility to pin prick is impaired. The patellar and Achilles reflexes and the deep reflexes of the upper extremity are increased. No ankle clonus or Babinski. The Romberg sign cannot be determined. Muscular power fair. There are well-marked choreiform movements involving all parts of the body, but a little worse in the upper than in the lower portion. No impairment of articulation.

Mental Condition.—She is carelessly dressed and has a slouchy attitude. Is deeply impressed with a sense of her own wrongs and talks continuously of her troubles. She is oriented as to time, place, and surroundings, but intellect and memory are both somewhat impaired. There is little insight, and, though she seems to recognize that she is not normal, she has no comprehension of her real condition. Is rather emotional and at times weeps in telling her wrongs.

cases, but I am able to recall several patients who suffered severely from insomnia and yet there is nothing in reference to it in their histories, as I have recorded them. Though some of the patients always had a sleepy expression, I cannot recall anyone, except the two young women referred to above, in whom there was an undue tendency to sleep. On the contrary, practically all suffered in greater or less degree from insomnia. Two of the five individuals referred to here were distinctly spastic.

Though there is, in these cases, some diversity in regard to hereditary predisposition, the period of life at which the disease appeared and the degree of mental impairment, I have ventured to group them all under the title of chronic progressive chorea. It was evidently the opinion of Huntington (1) as well as of the other American writers who preceded him in the description of hereditary chorea that it was an affection entirely distinct from senile chorea, but, though the distinction is still made by the majority of writers, a number of observers maintain that there is no essential difference, and the study of my cases leads me to the same conclusion. Several of these cases were originally diagnosed as senile chorea, but in every such instance where a later thorough investigation was possible it was found that there was a well-marked hereditary predisposition.

In view of the numerous clinical descriptions of the disease already available, and the excellent resumé of the literature contained in the articles of Good (2) and others, I shall refer in the discussion only to those points on which there still seems to be some difference of opinion or where it has seemed to me that my cases suggest something new.

In sixteen of the cases under consideration there is a clear history of chronic chorea in the ancestry, and in two (XIV, XVII), possibly in the ancestry and certainly in the immediate descendants. Six (IV, VIII, IX, XIV, XXVII) had brothers and sisters with the disease, and in three of these (VIII, IX, XIV), there is good ground for thinking that the ancestors were also affected. In my own cases, therefore, there is a history of a similar disorder in the immediate relatives in twenty-four instances and, in the remaining three, the history is absolutely lacking. This is a considerably higher percentage of heredity than was found by Diller (3), and Phelps (4), whose material also was drawn from hospitals for the insane. Hay (5), however, found chorea present in the ancestry in each of eight cases reported from a similar source. In view of the prolonged search necessary to obtain the histories in my cases, and the uniformly favorable result when the search was carried far enough, I am of the opinion that further observation would have brought to light hereditary predisposition in many of the cases reported as senile chorea, as Phelps (4) pointed out in referring to his cases.

In looking over my histories, one very striking feature is the relative absence of other forms of mental and nervous disorders, including children's chorea, among the relatives. This is in remarkable contrast to other forms of insanity. Several writers, notably Diller (3), Greppin (6), Hoffman (7), Ladame (8), Lepilli (9), Jolly (10), Remak (11), and Frank (12) have asserted that there is a more or less intimate relationship between chronic chorea, epilepsy and other nervous diseases, and Wollenberg (13), in this connection states that the choreic taint (heredity similaire) may be transformed into a more general nervous heredity (heredity of transformation), and show itself in epilepsy, special degenerative conditions, paranoia, etc., etc. Clark (14) reported in one family five cases of chorea and eight of insanity. The study of my cases, however, would lead me to think that the ordinary nervous and mental diseases are conspicuous by their absence in the families of these patients, especially, as I have said before, when they are compared with the other insane, and a careful resumé of literature dealing with the subject shows that the experience of the great majority of writers has been the same; and this absence of other forms of nervous disorder becomes all the more striking when one recalls with what care the family histories have been traced. Moreover, the mere statement of relatives that epilepsy has been present cannot always be relied upon, as it is quite possible for a well-developed case of chorea to be diagnosed as epilepsy, this having happened in case No. XII. Of all writers, Hoffman (7) has been most insistent on this relationship and, in the case which he reports with minutest detail in this connection, the lack of choreic heredity, either ascending or descending; the presence of epileptiform attacks in one of an undoubted epileptic family; the absence of mental failure after years of pronounced motor manifestations; the marked disturbance of reflexes; the irregularity of the pupils and, finally, the peculiar movements, all go to make a very doubtful case of progressive chorea. Moreover, to show any essential relationship between the two diseases it is necessary to demonstrate a more than occasional association, since both are largely dependent on a neuropathic heredity which probably may manifest itself in almost any of the neuropathic conditions, and the occasional association of any two of these therefore is not to be

wondered at, and certainly cannot be accepted as demonstrating any essential relationship between them.

In the twenty-seven cases here reported there were in the ancestry or descendants, eight individuals who were possibly insane or epileptic. Of these, two, the mother of patients XI and XII, and the father of patient XIX, were outside the line of choreiform descent, and therefore, could have had nothing to do with the origin of the disease, whatever influence they may have had in perpetuating it. In a third instance (XV), a son is described as being an imbecile, but it is by no means certain that he is not developing chorea. In a fourth instance (VIII), the father was "queer" and committed suicide, and chorea is certainly not excluded. The sister of one patient (XVII) died of "fits," the child of another (XVI) was defective, and in one case (X) both father and mother were insane, the father's mental failure coming on at eighty-five years of age. In addition, one or more relatives are described as being "nervous" in a few instances, but there is always good reason to wonder if these are not incipient cases of chorea, for, as is pointed out later, the relatives rarely recognize the disease until it is well developed. Huntington (1) says that a "nervous temperament" predominates in his families, but he mentions no actual cases of insanity outside of the choreiform manifestations. King (15) refers to an interesting case where Sydenham's chorea in childhood was followed at thirty-five by what seemed to be chronic chorea. In none of my cases could I elicit such a history nor do I recall meeting with any other in literature.

The disease affects males a little more frequently than females (Wollenberg 13). It may be transmitted through either side of the family, but Dana (16) reports a case where it descended exclusively through females though both sexes acquired it. In case XIX transmission was wholly through the female side, and in three generations only females acquired the disease, and they, with a single exception, only after marriage and pregnancy. Doubtless other conditions than heredity are concerned in the development of the disease, but my cases throw little positive light on this phase of the subject. Traumatism, mental or physical, has been given as a cause and it evidently played some part in a few of these cases. In one instance (XXIII) the attack

came on shortly after a fright just preceding labor, and in a brother (XXIV), of this woman the disease appeared after fright, and an attack of typhoid fever. In two instances (VIII, XXVI) it came on after typhoid, twice (VI, XIII) after a "fever," once (X) two years after scarlet fever; and once (XII) two years after a head injury of uncertain character. In two cases there is a fair presumption that severe physical exertion was a causative factor, once in a young man (XVIII) in whom choreiform manifestations developed after several days of excessive labor, and again in a soldier (XIV) at the conclusion of a three days forced march. Two women (XIX, XXVII) were unhappily married, and one (IX) from girlhood, had worked very hard and lived much alone.

Syphilis and alcohol, whether in the patient or ancestry, would appear to be relatively unimportant. Syphilis is not mentioned in a single case. Five patients drank moderately or to excess, and in three cases there was an alcoholic ancestry. Rheumatism was present in but five cases, and certainly plays no such important rôle here as in the chorea of childhood. Occupation and civil condition are apparently without influence.

It has been stated by several writers that in this country, at least, most of the affected individuals are probably descended from the original Long Island families. Dana (17) says that the cases so far reported are chiefly from New York, Connecticut, New Jersey, and Pennsylvania. Of my patients, however, seven were born in Europe, and among the remaining twenty I have found no evidence of descent from the New York families, though I must confess that I have not given much attention to this matter. There is, it seems to me, no doubt that a careful search would reveal a certain proportion of these unfortunate people in every part of the country. In two years in Minneapolis I have casually observed four cases in addition to the four reported in this paper, and have learned of two others so that the disease seems to be by no means as rare as we have been led to believe. Phelps (4), in one of the early papers on the subject, stated his belief that the disease would one day be found in all parts of the country. His own records showed one case of chorea to 600 admissions at the State hospital at Rochester, Minn. Diller (3) found it present once in 425 insane cases. At the Independence State Hos-

pital, as nearly as I can determine, there were twenty cases to 9000 admissions, a finding very close to Diller's. Robert Jones (18), however, in reporting a case from Claybury, England, says: "The disease, excluding senile chorea, does not occur in asylums more often than once in 3000 cases if as frequently." The exclusion of senile chorea here, however, makes the comparison with conditions mentioned above very uncertain. Menzies (19) says the disease has been recognized as a distinct entity in England for 100 years.

Huntington (1), and Waters (20) evidently believed the disorder to be one occurring only in those well along in adult life, but Lyon (21) reported its occurrence in early childhood; Huet (22) and others have since shown that it may occur even in infancy, and Gray (23), Sinkler (24), and Stevens (25) report congenital cases. The youngest individual I have seen is a girl of nineteen (XXVI) who has already had the disease two years. I am convinced, however, that very few cases are recognized until from one to several years after the real onset. This is partly due to a very strong inclination on the part of both patient and relatives to ignore or deny the existence of the disease as long as possible.

In some families there is a tendency for the disease to appear at a progressively earlier age in succeeding generations. Heilbronner (26) pointed this out but when Lange (27) referred to the same subject he could find only one other case in literature (Westphal's 28) where the age of onset was stated in succeeding generations so that any light could be thrown on the matter. In attempting a search of literature with the same end in view I found the difficulties that Lange had pointed out so great as to render the results almost valueless, though the field is not quite so barren of suitable material as he indicates. Mackay (29) referred particularly to this tendency and confirmatory cases can be found in the articles of Hay (5), Reynolds (30), Suckling (31), King (32), Osler (33), and probably others. In a recent case reported by G. S. Mill (34), seven descendants became affected at almost the same age as the ancestor. This was true also in Dana's (16) case and others. In nine of my cases where the history is such that this point is covered, the disease appeared in the descendants at an earlier period than in the ancestors six

times, once there was no difference and twice the ancestors were affected at an earlier age than the descendants. A careful study of several successive generations in a number of different families is necessary before this point can be settled.

Manifestations of ordinary physical disorders were not more frequent in most parts of the body than would be expected in a group of people many of whom were well along in life. Evidences of degeneracy such as Darwinian tubercles, low, narrow foreheads and asymmetrical heads were fairly common. Senile conditions such as general flabbiness of the tissues, arcus senilis, thickened arteries and anæmia were often seen. Four individuals had dilated or hypertrophied hearts and in one case (XVII) there was an aortic systolic murmur. Three individuals (VI, XVIII, XIX) showed cyanosis of the hands and feet on frequent occasions out of all proportion to any known heart-weakness present. In two of these cases this symptom was specially noticeable. Hoffman (7) mentions a similar condition in one of his cases. I regret that I did not give sufficient attention to this symptom in all the cases that came under my observation. Two patients (I, XIV) had albumin and casts, and one (XXVI) had attacks of eczema each winter. In two (XIII, XX) the skin had a peculiar brownish or bronzed color, not present before the chorea came on. The joints of the hands and feet and the lower jaw were very large in one man (XI). Muscular volume and power were greatly diminished in several, and in one instance (XVIII) the arms hung helplessly at the sides. Exertion quickly brought fatigue out of all proportion to the loss of muscle volume in some of those afflicted, and one young woman (XXVI), just developing the disease, complained of having tired easily from the date of the onset of the symptoms. On the other hand it is noteworthy that in some of the patients in whom the movements were violent, and continued not only during the day but also through a considerable portion of the night, there was no complaint of fatigue. This was particularly noticeable in case XI, and also in case I, where the physical strength had been remarkable and continued so for years after the disease appeared. This insensibility to fatigue has been remarked by both Good (2), and Sinkler (24). In case X there was some contracture of the fingers and toes. A peculiar sleepy expression with ptosis of the eyelids was present

several times (see Figs. V and VI), a similar appearance is noted by Mackay (29). Menzies (19) says that different families affect different clinical types, and this fact is fairly well illustrated by the ptosis in my cases. Eight of the patients presented this phenomenon. In four (XV, XIX, XX, XXVI) I did not see any of the relatives, and so could not determine if it were common to the family. Once it was present in the son (XVIII), and not in the father and, in another family, it was found in each member seen (XXII, XXIII, XXIV).

The part of the body first affected varied considerably. Sometimes the movements were first noted in the hands, sometimes in the lower extremities and sometimes in the face. The general belief appears to be that they are usually observed first in the face and hands but, in my cases it is said, they were noticed first in the feet and legs considerably more often than elsewhere. Owing to the very insidious onset, however, this is a difficult question to decide. The movements have often invaded several parts of the body before they are recognized at all. In some instances the first motor disturbance noted was awkwardness of movement and an inability to hold things in the fingers. In the only two cases (XXVI and the son in case XX) in which I had the opportunity to observe the earliest movements, these consisted in an elevation of the brows and a shrugging of the shoulders with movements of the head. Ultimately, however, practically the whole body is involved in most instances, though even at the height of the disorder there is much variability in the severity of the movements in different cases and as to the part of the body most affected. Thus in one patient (XIX) the movements were so slight when lying quietly in bed that scarcely anything was observable save a slight lifting of the brows. In another (XI) they were so violent at all times that he could scarcely be kept in bed without mechanical restraint, and the movements were so strong at times as to overturn the heavy oak chair in which he was seated. In seventeen of the cases the movements were general though not necessarily involving all parts of the body to an equal degree. Nine times they were much more pronounced in the upper part of the body than the lower, but there was no instance where this condition was reversed. Five times they were worse in one side of the body than the other and in several in-

stances they were more marked in one extremity than in the opposite. Once (I) they were almost limited to one side of the body. In four cases the chest and abdomen were most involved, and once, in a case (XXII) of recent development, the movements were almost confined to the hands. Respiration was frequently affected and in two instances there was irregularity of the heart (VIII, XIV), the action corresponding to some degree with the mildness or severity of the general movements. Once (XI) the bladder seemed to be involved and once possibly (XVIII), the stomach. Aside from Gower's (35) statement that "even the action of the bladder may be deranged," these are, so far as I know, the first instances reported in which the involuntary muscles were affected, though Frank (12) says his patient "urinated with more frequency and greater pressure" than normal. In some of the cases, the movements in the abdomen and scrotum were constant and severe but not infrequently these parts, especially the latter, remained entirely free. Speech defect appeared in most of the cases though, at times, only when the disease was far advanced. Five individuals were wholly unable to speak at the last and contented themselves with making more or less unmeaning noises. Some had a peculiar drawling speech. In all of the patients, save one, volition lessened the movements for a short time, though the interval was always followed by a more violent explosion. In one patient (XVIII) volition temporarily lessened the chorea in the part undertaking the movement but made it worse elsewhere. There are some cases recorded where volition either had no effect on or actually increased the movements. Wollenberg (13) says it is only in incompletely developed cases that the movements are under the control of the will but, judging by my experience, this statement is incorrect. In all my patients the movements were absent during sound sleep but not always during light slumber. As there has been some dispute on this point, I spent considerable time in studying it and can speak with confidence. In a number of the cases, when first getting to sleep, or, toward the time of waking in the morning, or if slightly disturbed at any time during the night, the movements were present in greater or less degree, but in none were they found at any time during deep sleep. In a woman suffering from a fractured thigh (XX), contrary to what one might expect, the move-

ments did not in any way interfere with healing though I was assured that they were present in this extremity as much as in the other up to the time of the injury.

Vaschide and Vurpes (36) state that the movements cease entirely before death, basing their conclusions on two cases. This certainly does not always hold true, for, in the eight cases whom I observed at the time of death, the movements in four were little, if any, changed up to the moment of dissolution. Once they were more violent on the day preceding death than on any previous occasion, once they disappeared from an infected arm some hours before death, once they were very slight for two days previous and once, in an individual who died in a comatose condition, they had been absent for two days. In Ladame's (8) case they were feeble during the last two weeks and entirely absent the last day. Menzies (19) reported a case of chorea complicated with tuberculosis in which the movements became almost imperceptible. Kræpelin (37) says that the chorea may even subside until only slight traces are found. So far as I can determine this did not occur in any of my cases though, in some of the worst, the movements were not by any means the most striking feature of the disease, and it is possible that in these individuals the motor manifestations at some previous time had been more pronounced.

In twelve of the fifteen cases where the reflexes were carefully studied the tendinous reflexes were found increased. Once the patellar reflexes were normal, once decreased and once absent. On the contrary, the pupillary reflexes were almost invariably normal or decreased. Ankle clonus was twice present along with marked increase of patellar reflex. It has been stated that there is a decided tendency for the quadriceps to go into and remain in spasm for a little time when the patellar tendon is tapped. In two cases I found this present but in several others where it was carefully sought it was not obtained. The Babinski sign was not found. It must be said, however, in reference to the tendinous, abdominal, cremasteric and Babinski reflexes that the presence of the choreiform movements and the spasticity, referred to later, rendered their study difficult and sometimes quite impossible. In Riesman's (38) case the patellar reflexes were gone, and in one of Hoisholt's (39) they were practically absent. Riggs (40),

Menzies (19), Bondurant (41) and others have reported cases with ankle clonus.

A well-marked increase in muscular tonicity was found in nearly all of the well developed cases where it was sought, and in several (see XVIII and XIX) it was a very striking symptom. The only other references I have seen to this condition are Osler's (33) statement that he found some degree of stiffness in some of his patients, and Collins' (42) statement that there was slight rigidity in his case. Osler (33), however, evidently did not consider the symptom important, for later he speaks of spasticity of the muscles as a differential sign in diagnosing athetosis from chorea. In Tomlinson's notes on case XXV this condition is mentioned. In view of the prominence of this symptom in my patients I am surprised at not finding it described more frequently elsewhere.

Reaction to touch and temperature seemed almost or quite normal in all of the patients studied but to the persistent pricking of a pin there was slow response in several cases and very little evidence of pain, and I have repeatedly seen these patients undergo what, to the ordinary individual, would have been severe pain with little or no sign of annoyance. I was told by the husband of one woman (XXV), and this without questioning or suggestion on my part, that he had repeatedly seen his wife, in her awkward attempts to operate the sewing-machine, run the needle through her finger, with no sign whatever of pain. Marion and Putnam (43) reported a choreic woman who committed suicide by taking bichloride of mercury and during twelve hours of vomiting and purging, before she died, gave no evidence of pain. Osler (33), Sinkler (44), Hoffman (7), Frank (12), and others refer to this dulling of the sensibility to pain but Kræpelin (37) says that sensibility is normal and most authors agree with him or do not refer at all to the matter. In Rusk's (45) case general sensibility was abnormally acute.

Several writers have reported cases of chronic chorea without mental disturbance and there is no mention of mental deterioration in Waters' (20) or Lyon's (21) reports, though Huntington (I) attached great importance to it. In Riesman's (38) report of sixty-five cases of chronic chorea in adults, no case with a history of hereditary predisposition being admitted, mental im-

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pairment existed in 41 per cent. Most modern writers, however, insist strongly on the mental factor and Wollenberg (13) in his excellent article questions the possibility of a case in which it is totally absent. Ladame (8) thinks there may be mild cases in which there is not a termination in dementia though he thinks the matter needs further light. In all the cases reported here, mental impairment was present and it was present in all the cases I have seen with a single exception. For three years past I have had frequent opportunities to casually observe an old lady, now over seventy years of age, who shows very slight choreiform movements. Her daughter, however, at forty-five is a typical case of chronic progressive chorea, with marked motor involvement and considerable mental disturbance. At her advanced age the old lady is still noted for her bright mind and excellent disposition. So far as I can see she shows no mental disturbance of any sort, though I have not been able to make a careful examination. Dieffendorf (46) mentions a case where a man after fifteen years of chronic choreiform movements was still able to attend to a large law practice.

There has been considerable discussion as to whether the mental or motor symptoms come first but the general opinion favors the earlier appearance of the motor disturbance. In my experience reliable information on this point has been very difficult to secure. Ordinarily one must rely on the relatives and they are very slow to recognize the motor signs and even slower to note the mental. So far as the record goes it would seem that in almost all of my cases the motor disturbance appeared first but in the only instance (XXVI) where I have had an opportunity to carefully study a case near its beginning, the mental symptoms came first and the excellent history given in this case would indicate that in the other members of this family the order of sequence was the same. Rossi (47) considers the disease a psychosis, and the motor symptoms as secondary. Wollenberg (13), on the other hand, says the physical symptoms usually come first. Though my own cases would seem not to confirm this view, I am convinced that, in many cases at least, the mental disturbance is the first to appear. Moreover, in those cases where heredity is pronounced, and the disease appears early in life the mental symptoms are usually prominent as compared with the motor. To this latter class Hallock's (48)

term, dementia choreica, well applies. Especially in those cases where the disorder appears late in life, it has seemed to me that the motor symptoms may antedate the mental and the latter, for a relatively long time, at least, be not at all prominent.

In a case with well developed mental disturbance there is present a gradually increasing dementia, marked irritability and, not infrequently, distinct delusions of persecution. There is great variability in the mental symptoms, however, just as in the motor, and, as already remarked, they are present in some to a much greater degree than in others. Moreover, the form which the mental disturbance takes varies considerably. Thus, in a case which appears early in life, there is a high degree of dementia, while in those coming on at a later age there is less loss of thought power but more irritability and a greater tendency to imagine intentional affronts. Owing to the lack of information as to the mental condition at the beginning of the attack it is difficult to say much of the early symptoms. In a large proportion of the cases, seen long after the disease appeared, the relatives referred to the bad temper and general irritability of the patient as the earliest sign, but in the few instances where I can learn anything definite and reliable as to the onset a weakness of judgment and initiative, absent-mindedness, general dissatisfaction with surroundings, a growing selfishness and irritability are among the earliest symptoms observed. Wollenberg (13) says a decrease in thought-power is the first mental manifestation. Ladame (8) thinks loss of intellectual power is the fundamental and essential feature in every case of the disease and often the first symptom. The affected individuals are somewhat reserved in speech except in those instances where an overwhelming sense of injury leads them to tell of their condition and wrongs. They rarely become totally disoriented as to time, place or persons, and the degree of dementia, though very considerable in some, especially toward the last, is never nearly as great as in general paralysis or senile dementia. Moreover, I have often been struck with the thought that on close inspection almost all of the well-advanced cases are really much less demented than they seemed at a first glance. I cannot, however, subscribe to the statement of Kattwinkel (49) that the apparent dementia is merely the result of the patient's inability to concentrate himself or to the idea of Franscotti (50)

that the intellectual failure is dependent on the constant convulsive condition which clogs the patient's attention. The fact that in some cases, at least, the mental symptoms considerably antedate the motor forbids, such an idea even if there were no other argument against it. As in senile dementia the loss of memory for recent events is most conspicuous. As a rule the patients attend fairly well to what is said to them, comprehend the remarks and answer more or less relevantly but this was not always the case as was seen in XIII and XVII. Insight was almost invariably absent, a condition mentioned by several authors, and this was true at every period of the disease.

Many authors refer to the great mental depression present at a certain stage and particularly to the individual's feeling of horror when he recognizes that he is in the grip of the disease. Of this mental state I have seen little or nothing and on the contrary have often been struck with the lack of this feeling prevailing among them. Very few seem to have any conception whatever of the fact that they are under the control of so terrible a condition and many, even at the height of the disorder, do not appear to realize that anything serious is wrong, as happened in the case of Hoffman (7) and others. Some of my patients did not even recognize that they had a motor disturbance even when it was very striking to others. This lack of appreciation of the real meaning of the disorder is shared, to at least some degree, by the normal members of the affected families for, in taking the histories of all the foregoing cases, I cannot recall a single expression as to the impropriety of marriage in these families, except in one instance (XXV), and that was from a man who was the husband of one of the victims and therefore not really in the family. He explained this disregard of the inadvisability of marriage by saying that in the individuals he had known the earliest symptom of the trouble was a mental defect and on account of this the individual was unable to recognize his own condition by the time it had become so marked as to naturally awaken comment. Lyon (21), Sinkler (44), and Reynolds (30), mention instances where marriage has been prevented on account of chorea in a family. Lepilli (9) says that even those members of the family who remain free from the chorea are also frequently demented or at least bizarre and "nervous," and Huntington (1) in speaking

of those not affected says the "nervous temperament greatly predominates," and "nervous excitement in a marked degree almost invariably attends upon every disease these people may suffer from."

Hallucinations and illusions were uncommon and are not often mentioned by other writers. One young man (XVIII) imagined he saw and heard wolves on several occasions and another man (XIII) thought he could talk with God and hear his voice. Berry's (51) patient had hallucinations of sight and hearing and Rusk's (45) patient had hallucinations of sight.

Delusions, on the contrary, were extremely common and a large proportion of my patients were victims of delusions of persecution. In several of the cases this condition was so pronounced as to render the victim's state of mind most pitiable. For example, nearly all imagined they were the victims of peculiar persecution by the nurses or other patients and many thought they were being starved; this latter doubtless arising from their enormous appetites as much as from their general sensitiveness. Nearly all ate gluttonously and with great rapidity and consumed enormous quantities of food, a condition mentioned by Ladame (8). Delusions of grandeur were occasionally present and these sometimes had a religious tinge. Thus one man (XIII) called himself the son of God and said he was under His special care. Another man (XIV) called himself the Christ, and one man (I) imagined he had the power to cure disease. Berry's (51) patient and four of Phelps's (4) patients had delusions of grandeur. Mackay (29) had a patient with peculiar religious ideas.

Irritability, often of a very high grade, was almost invariably present, and many patients would break out in acute paroxysms of rage on the slightest provocation. Attempts at injury and even murder occurred under these circumstances. It does not seem to me, in this connection, that Kræpelin (37) lays sufficient stress on the irritability. To say that "now and then persecutory ideas are detected which are related by the patient without special emphasis" is far from doing justice to the actual conditions as observed in my patients. Abnormal sexual ideas with jealousy were observed a few times.

Huntington (1), in his original paper, mentioned the marked tendency to suicide and nearly all authors since have referred to

that the intellectual failure is dependent on the constant convulsive condition which clogs the patient's attention. The fact that in some cases, at least, the mental symptoms considerably antedate the motor forbids, such an idea even if there were no other argument against it. As in senile dementia the loss of memory for recent events is most conspicuous. As a rule the patients attend fairly well to what is said to them, comprehend the remarks and answer more or less relevantly but this was not always the case as was seen in XIII and XVII. Insight was almost invariably absent, a condition mentioned by several authors, and this was true at every period of the disease.

Many authors refer to the great mental depression present at a certain stage and particularly to the individual's feeling of horror when he recognizes that he is in the grip of the disease. Of this mental state I have seen little or nothing and on the contrary have often been struck with the lack of this feeling prevailing among them. Very few seem to have any conception whatever of the fact that they are under the control of so terrible a condition and many, even at the height of the disorder, do not appear to realize that anything serious is wrong, as happened in the case of Hoffman (7) and others. Some of my patients did not even recognize that they had a motor disturbance even when it was very striking to others. This lack of appreciation of the real meaning of the disorder is shared, to at least some degree, by the normal members of the affected families for, in taking the histories of all the foregoing cases, I cannot recall a single expression as to the impropriety of marriage in these families, except in one instance (XXV), and that was from a man who was the husband of one of the victims and therefore not really in the family. He explained this disregard of the inadvisability of marriage by saying that in the individuals he had known the earliest symptom of the trouble was a mental defect and on account of this the individual was unable to recognize his own condition by the time it had become so marked as to naturally awaken comment. Lyon (21), Sinkler (44), and Reynolds (30), mention instances where marriage has been prevented on account of chorea in a family. Lepilli (9) says that even those members of the family who remain free from the chorea are also frequently demented or at least bizarre and "nervous," and Huntington (1) in speaking

of those not affected says the "nervous temperament greatly predominates," and "nervous excitement in a marked degree almost invariably attends upon every disease these people may suffer from."

Hallucinations and illusions were uncommon and are not often mentioned by other writers. One young man (XVIII) imagined he saw and heard wolves on several occasions and another man (XIII) thought he could talk with God and hear his voice. Berry's (51) patient had hallucinations of sight and hearing and Rusk's (45) patient had hallucinations of sight.

Delusions, on the contrary, were extremely common and a large proportion of my patients were victims of delusions of persecution. In several of the cases this condition was so pronounced as to render the victim's state of mind most pitiable. For example, nearly all imagined they were the victims of peculiar persecution by the nurses or other patients and many thought they were being starved; this latter doubtless arising from their enormous appetites as much as from their general sensitiveness. Nearly all ate gluttonously and with great rapidity and consumed enormous quantities of food, a condition mentioned by Ladame (8). Delusions of grandeur were occasionally present and these sometimes had a religious tinge. Thus one man (XIII) called himself the son of God and said he was under His special care. Another man (XIV) called himself the Christ, and one man (I) imagined he had the power to cure disease. Berry's (51) patient and four of Phelp's (4) patients had delusions of grandeur. Mackay (29) had a patient with peculiar religious ideas.

Irritability, often of a very high grade, was almost invariably present, and many patients would break out in acute paroxysms of rage on the slightest provocation. Attempts at injury and even murder occurred under these circumstances. It does not seem to me, in this connection, that Kræpelin (37) lays sufficient stress on the irritability. To say that "now and then persecutory ideas are detected which are related by the patient without special emphasis" is far from doing justice to the actual conditions as observed in my patients. Abnormal sexual ideas with jealousy were observed a few times.

Huntington (1), in his original paper, mentioned the marked tendency to suicide and nearly all authors since have referred to

it but Ladame (8) writing in 1900 stated that after an exhaustive search of the literature he had not been able to find on record a single case of suicide or "serious attempt" at suicide. He denies that the threats of suicide are the result of the great mental depression of the individual on coming to realize his true condition, as stated by several, but says that, on the contrary, he has not observed this depression and that the threats of suicide are manifestations of irritability made more with the intention of worrying the relatives than with any real thought of carrying them out. In my experience Ladame is correct in ascribing these threats of suicide to the attacks of violent passion into which the individual is frequently thrown by his irritability, though he scarcely does justice to the fact that a tendency to suicide really exists. Threats of suicide are certainly exceedingly common and more or less pronounced attempts are often mentioned. In addition to the fact that there is good ground for argument as to whether several of the latter were not "serious attempts," Huntington (1) had stated that he "knew of several instances of suicide of people suffering from this form of chorea or who belonged to families in which the disease existed." In 1892 Phelps (4) reported a suicide and in 1903 Burr and McCarthy (52) reported another. In 1904 Marion and Putnam (43) reported a successful attempt from the use of bichloride of mercury. Wollenberg (13) in 1903 reported a suicide by drowning. In my series two patients (XIV, XVI) made undoubted attempts at suicide. The father of the patients described under (XIII and IX) committed suicide and was probably choreic, and the father, certainly choreic, of the patient described under XXV, hanged himself.

One of my patients (IX), with symptoms considerably different from those of the others, probably began as a case of ordinary insanity and later developed chorea, though the lack of an exact record makes this uncertain.

As already pointed out I can see no means of diagnosing accurately between chronic progressive chorea with hereditary predisposition and chronic progressive chorea without predisposition. To me they seem to be the same disease except that when the heredity is marked the disease often appears earlier in life, and the tendency to dementia is greater. From children's chorea the diagnosis will usually be easy but in cases where chronic

chorea begins very early in life or children's chorea comes on late in life there might be great difficulty. The inability to control the movements in Sydenham's chorea by means of the will has often been suggested as a diagnostic point but Mitchell and Rhein (53) pointed out several years ago that, not infrequently, there is some control over the movements in Sydenham's chorea by means of the will, and several cases can be found in literature where, in chronic progressive chorea, the movements were not under the control of the will. Considerable has been written as to the difference in the character of the movements in the two conditions, but I can see little dissimilarity except that the movements in chronic progressive chorea are a little slower than those of children's chorea, and even this distinction did not hold true in case X. It has been stated that the movements in children's chorea are more violent, but I have never seen choreiform manifestations any worse than in case XI.

Certain choreiform conditions due to organic lesion would probably be impossible to differentiate.

Several authors have referred to the similarity between parietic dementia and chronic progressive chorea, and Bondurant (41) goes so far as to say that they may be interchangeable. I have never seen a case where a differential diagnosis would be difficult. The history of the hereditary predisposition, the long duration of the disease, the presence of the peculiar choreiform movements and of irritability and the absence of expansiveness in chorea as opposed to the expansiveness and striking delusions of grandeur, the pupillary disturbances, the history of syphilis and the peculiar speech defect in parietic dementia would probably suffice to remove all doubt.

Huntington (1) stated that the disease can neither be cured nor ameliorated and this corresponds to the view of practically every other writer. Riesman (38) reported 20 per cent of cures, but it is certain that not all of his cases belong under the heading of chronic progressive chorea as that term is employed in this article. Herringham (54) reported eleven cases of chorea in the aged with recovery, but these were probably cases of chronic minor chorea. Fry (55) reported a case of chronic chorea, with cure at sixty-nine, but thought it was a simple chorea in an aged person. Gowers (35) quoted a case with recovery after the use

of arsenic. Lange (27) thought there was some improvement in his patient following confinement in a hospital. Though the condition of a number of my patients varied from time to time no treatment had any permanent effect. While the prognosis is unfavorable, therefore, death is usually long delayed and is finally often due to some intercurrent disorder.

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TECHNICAL ASPECTS OF EXPERIMENTAL PSYCHOPATHOLOGY.

By FREDERIC LYMAN WELLS, PH. D.,

Assistant in Pathological Psychology, McLean Hospital, Waverley, Mass.

The object of this article is to review, from as concrete a standpoint as may be, certain of the more immediate problems of experimental psychology with especial reference to their pathological applications. Into the merits of the experimental method there is no need to enter here; the foundation of the movement was laid in Kraepelin's opening contribution to the *Arbeiten* (1), and most other contributors, during the earlier years of that publication, deemed it wise to preface a pathological study with some sort of an *apologia*. Recently, the situation has been reviewed by Franz (2), and still later by Woodworth (3). In 1904, the principal work up to that time was critically summed up by Hoch (4), and later its general scope has been briefly outlined by Farrar (5). It will not be attempted to cover again the ground gone over in Dr. Hoch's article, save at one or two points where a criticism may be ventured. It need perhaps only be brought to mind here that no science can advance beyond its methods, and that sciences do advance as they introduce more precise and quantitative methods of measurement and analysis. From this viewpoint, the experimental method is justified in the history of all scientific progress.

The experimental method as found in present psychiatry is mainly included in the mental tests in ordinary clinical use. The function of the present clinical tests is to afford a measure of certain mental qualities, from which the clinician, through largely unanalyzed experience, may be able to draw certain conclusions of immediate diagnostic significance. It is indeed probable that a practiced examiner could know from ordinary observation most of what the conventional tests reveal; it is their function rather to afford an objective framework in which to present the clinical picture to others. The tests have been evolved from within psy-

chiatry itself, and it is to be feared that the actual factors in the tests are often very insufficiently understood. We may give a clinical test to measure a memory defect, but to what extent it really does measure a memory defect, or what sort of memory defect it measures, or to what extent the individual measured falls outside the variability of normal performance, are questions with which the clinician is only beginning to greatly concern himself.

However, perhaps the most immediate reason why the psychological test has shed so little light upon mental pathology is that the clinical tests as at present applied are practically unworkable for comparative purposes. When they have given the most roughly quantitative conception of the clinical picture they have served their immediate use. Few will claim that the Kraepelinian system of diagnostic entities could have been built up upon any system of tests now or ever current in clinical practice. Yet every scientific classification must ultimately stand or fall by a system of measurements. A proper series of measurements should afford a statistical demonstration of the clinical varieties with which we are familiar far more accurate than is attainable through unanalyzed clinical experience, as well as render it possible to sketch in certain phases the life history of the psychoses from onset to the limit of co-operation.

Almost all psychological tests require the active compliance with certain experimental conditions, and this can be secured in only a relatively small percentage of cases. Only a very limited percentage of defectives could be included in Nornworthy's study of the feeble-minded, and considering the character of the tests employed, it is doubtful if the average insane hospitals could furnish so large a percentage as this, in whose results a careful experimenter would have any confidence. I question very much if 5 per cent of such a group could undergo the Freshman Tests of the psychological department at Columbia University. Only now and then one chances upon an individual who makes a patient, willing, and conscientious subject; hence the large proportion of studies involving a single case.

Another difficulty lies in the heterogeneous clinical groups over which the material is certain to be distributed. Like the feeble-minded, the insane may, *a priori*, be considered either as a number of separate species, or as the extremes of the normal distribution

in their various special traits. Even so, ten G. P.'s, manic-depressions, or dementia præcox cases would almost certainly differ from each other more¹ than ten normal individuals would so differ. From the statistical viewpoint of a normal psychology, therefore, the establishment of a group standard is a vastly more difficult task. The greatest barrier to progress in experimental psychology in the normal field is the fact of unequal practice; to this, pathological psychology adds another in equal degree; the smallness and heterogeneous constitution of the groups to be studied.

To sum up, a threefold aim may be set to the co-operation of psychiatry and experimental psychology. First, a better organization of the clinical tests with special reference to their comparability between individuals. Second, the exhaustive study of recognized clinical entities by methods more exact than are ordinarily available for clinical tests with a view to (a) developing methods for a more precise measurement of the effects of therapeutic agents, and (b) to ultimately determining quantitatively the groups into which the various psychoses separate. And, thirdly, the application of psychological experiment to a more intimate analysis of pathological mental processes with a view to gaining a clearer insight into the interpretations which clinical observation has suggested. Efforts in the first of these fields have been made by Somnier (6, 7), Toulouse (8), Piéron, Vaschide (9), Guicciardi (10), and Donaldson (11); examples of the second line of work are the studies of Franz and Hamilton (12), Loewald (13), and Haenel (14); in the third, one needs only to mention the name of Jung.

GENERAL TESTS.

There is little need to emphasize, from the standpoint of either a normal or a pathological psychology, the desirability of a standard and trustworthy series of general tests. In normal psychology we wish to obtain a certain knowledge about the subject in definite and objective terms, and our series is valuable in so far as it results in information about his general make-up which it is well for him or us to have. On the pathological side such obser-

¹ It may be noted that if they did not, it would argue the existence of separate species.

vations are valuable as a general analysis of the *status præsens psychicus*, and in studying improvement or deterioration under special conditions. All this, of course, presupposes that the analysis of this *status præsens* is experimentally possible. To what extent it may be so, we shall be in a better position to judge after we have examined some of the problems in which the need for such analysis has arisen, and the ways in which it has been met.

There are two points of view from which such a problem as this may be approached. Most investigators determine upon certain qualities that they wish to measure, and construct and interpret certain tests to measure these qualities. *Auffassungsfähigkeit* is measured by the reading of syllables on a rotating drum, *Geistige Leistungsfähigkeit* by the addition test. We start out with the qualities that we wish to measure and then (in theory) get the best test we can to measure them. But in view of the fact that we are so limited in our objective analyses of mental functions, it may in the majority of cases seem desirable that we should start out as much from the test as from the function. Upon occasion, a certain special function may acquire such a degree of definiteness and immediate importance, that we may well bend our energies to devising a special test for this and this only. But it must not be forgotten that external conditions, mechanical and otherwise, limit us in the sort of tests we can make, as well as in the accuracy with which we can make them. The fact that it may be possible to analyse out with some definiteness a certain mental function does not itself provide that there shall be an accurate and trustworthy measure for that function. It would doubtless be a very fortunate thing if we could measure, with any objective validity, sensibility to pain; but we cannot do it, and some of the best known instruments for this purpose are as good examples of precision running amuck as experimental psychology affords.

On the other hand, when we are in possession of a technically fairly good form of test, we are prone to interpret it in terms of a function whose very existence is doubtful, to say nothing of its being measured by the test in question. There is grave danger in starting out with a too fixed system of ideas about the qualities that are being measured. It is well to be very skeptical about a person's "voluntary motor ability," "rate of perception," or "*Auffassungsfähigkeit*," while the records of his performance

in the tapping test, the *A* test, and the rotating drum test are matters of entirely legitimate interest, and frequent importance.

It is probably safer, therefore, to devote one's energies to the development of tests with as few technical sources of error as possible, and then to determine empirically what our tests measure.

The literature which we may consider on this point falls into three main divisions. In Germany the problem has been represented almost exclusively in the Kraepelinian school, and has had a large share of the attention of these workers. In America, the series of Columbia Freshman Tests (15) probably represents the most extensive single series of observations of this nature that we have. A small group of researches has grown up about this special problem, and may be considered with it. The remainder of the material is not very homogeneous, but contains many important single researches.

There is no space to enter into detailed criticism of the Kraepelinian attitude toward the general problem, in spite of its special importance in the pathological field. Nor is there need to enlarge here upon the fundamental advantages of its viewpoint toward experimental psychology, and the profound influence that it has had on its development; but these very conditions may perhaps justify calling brief attention to the reverse side of the picture. It is characterized by a certain narrowness of the experimental horizon, manifesting itself most strikingly in the relative neglect of the motor sphere beyond the ergograph. All save the most recent researches exhibit a great conservatism of method; there is very little change from the procedure of the original *Beeinflussung* (16). Indeed, it is to be feared that the *Psychologischer Versuch in der Psychiatrie* would serve quite as well for an epilogue to the first four volumes of the *Arbeiten* as for a prologue. As regards the introduction of new methods, it must be admitted that in such a problem as this one stands ever between the Scylla of too few and the Charybdis of too many experiments. The former means too narrow an outlook, the latter, a frequently distorted one, on account of the unreliability of the individual results. Still, it cannot be denied that for the subjects indicated in the titles, as well as for the general conclusions drawn, the scope of the ex-

periments³ is frequently too small. To speak of the addition test, for example, as a measure of *Geistige Leistungsfähigkeit* means the assumption of at least a certain degree of correlation between this and all other higher mental processes. This is unproved, and it has appeared in certain experiments reported by the writer that various forms of addition tests (Kraepelin's was not among them) were by no means well correlated with each other. Most of these investigators use other tests than the ergograph and the addition experiment, but the sensory and motor sides are always meagerly represented. The technique is often far from the best; witness such a procedure as the use of two lip-keys for the choice reaction (17).

If the series of tests described in the *Arbeiten* have perhaps been too narrow in their scope, the opposite extreme is illustrated in the above mentioned Columbia Freshman Tests. These include almost every function that is open to psychological experiment, with the inevitable result of too few observations in each test. Simple reaction time receives five observations, pitch discrimination two. While such a series of observations conducted on a large number of individuals might in some cases establish a norm of a certain validity, they are hardly of a character to determine an individual position within the group, nor, consequently, the distribution of ability in the various measures.

Of a more intensive character are the series of experiments used in the researches of Norsworthy (18), Thorndike (19), Marsh (20), and Jones (21). These have all dealt with problems which, from one point of view or another have required some quantitative determination of general mental activity. Thorndike's measurements on twins are confined to a number of association tests, and all but three of Norsworthy's tests are included among the higher mental processes. In investigations of their special character such tests have of course a great advantage in the simplicity of their apparatus. Marsh and Jones have laid more stress on the motor side, those of the latter investigator being the broader in scope. On the whole, it is probably the best of the series described, though it is applicable only under labora-

³ This does not mean number of observations, though certain investigations are also open to this rather hackeneyed objection.

tory conditions. These researches are typical of the more recent experimental practice along these lines, the precise tests used in each case being as follows:

Norsworthy, *A* test, *a-t* test, memory, logical memory, noun test, part-whole, genus-species, maze test, perception of form, perception of weight.

Thorndike, *A* test, *a-t* test, *e-r* test, misspelled words, addition, multiplication, opposites.

Marsh, dotted squares, tapping test, 3-hole test, force of movement, *A* test, addition, simple and choice reactions, visual and auditory memory, associative memory, and much other material from independent sources.

Jones, perception of pitch, areal sensitivity, tapping, finger and grip dynamometer, addition, visual and auditory memory, pulse, blood-pressure.

Mention may also be made of the tests used by Gilbert in his extensive study of school children (22), and by Gilbert and Patrick on the effects of loss of sleep (23). Gilbert's first research on school children includes tests for the perception of weight and color (brightness?), the size weight illusion, the tapping test, initially and after 40 seconds' fatigue, as well as simple and choice reaction time to light stimuli. The experimental methods are rather simple. In a later research determinations are made for pulse rate, pain threshold, judgment of distances by motor and visual estimation, and the tapping test. A much better series is that used in the loss of sleep experiments, which includes threshold of pain and vision, two dynamometer tests, the tapping test, simple and choice reaction to sound, an addition test, memory (through learning by heart), temperature and pulse, though several of these are admittedly imperfect from a technical standpoint.

On the pathological side, excluding the above mentioned work of Norsworthy, which is in a class by itself, the most extensive series of observations is that of Reis (24), concerned entirely with the higher mental processes. A considerable number of tests are used, including *Auffassungsversuche* by Cron and Kraepelin's method (25), simple addition tests, repetition of alphabet and counting to 50 as rapidly as possible, naming as works of one category (animals) as rapidly as possible. To these are added the time of naming colors, letters, words, adding two figures, and deciding whether the object presented is "animate" or "inanimate," "pleasant" or "unpleasant." Gross (26) applied the ad-

dition experiment, the *Schriftwage*, memory by Finzi's method (27), and a few simpler tests to a traumatic psychosis; Lefmann (28) used choice reactions, the *Schriftwage* and the ergograph in depressions. Ranschburg (29) contributes a study of the higher mental processes in senile dementia through the media of simple and choice reactions, naming words, additions, *Urteilsreactionen* as used by Reis, and uncontrolled associations, using the discrete method of measurement, with the chronoscope. W. G. Smith's experiments on epileptics (30) include on the motor side the tapping test, tremor, rhythm-sense, and the ergograph used for maximal contraction only. The higher mental processes are represented by tests of immediate memory for letters and recognition memory for pictures; also a continuous choice reaction test, sorting a pack of cards according to suits. A test of discrimination for length of lines was also added. Because the above series have been for the most part uncritically presented, it must not be thought that the writer wishes to present the results at their face value. In several cases the technique seems faulty, the interpretations naive.

The most recent researches of this nature are those of Franz and Hamilton (12), and Franz (31). These are very similar in scope. The first consists of measurements of pressure and pain thresholds, accuracy of movement (muscular sense, visual memory?), the tapping test, simple and choice reaction times, speed of reading aloud, a form of the *A* test, and the distribution of colored cards. The comparative study of manic and depressed states omits the sensory experiments and includes a form of addition test. One may note the minor part uniformly played by sensation in the above lists. As an offset to this, the researches of Spearman (32) and Van Biervliet (33) have dealt entirely with sensory material, seeking to establish a correlation between general intelligence and sensory efficiency. Some of the difficulties of this procedure have already been pointed out, though positive results are claimed in each case. Spearman's searching review of this entire subject will perhaps absolve the writer from further detailing its history here.

The above mentioned sources probably include all practicable mental tests hitherto used that have any significance, and of course a good many others. In discussing what tests may be most ap-

plicable to our immediate field, one might at first think that we had two problems to deal with; whether as in the Columbia Freshman Tests we are concerned with a series of experiments to be made only once, on an unlimited number of individuals, or whether it is intended to study a specific phenomenon in a limited number of subjects, the tests being repeated as extensively as may be desirable, as in those of the *Arbeiten*. In the pathological field, we meet with the first requirement mainly in clinical examination, the second in the more detailed analyses of special research. It is difficult to see the value of this distinction, however, save as an excuse for the occasional employment of cruder methods. Under any circumstances each observation ought to be made as frequently and as accurately as is possible. The real distinction is whether we are able to work under laboratory conditions, or must get along without the aid of special apparatus. This, as we shall see, is of greatest importance in the motor field.

An exhaustive critique of the details of the subject is beyond the present scope, if not also beyond the capacity of a single individual; nevertheless, there are important factors in the problem which the clinician may not appreciate at their full value, and which may here justly claim a share of attention.

Some mention has already been made of sensory possibilities in this field. The problems, however, are mainly of a research character, and the clinical test must concern itself with threshold determinations in such special fields as may appear to have the most immediate clinical application. So great a diversity exists in the problems as well as in the methods of investigation that but little of general sensory significance is to be expected from inquiry of this character. Of the two methods which may be mentioned as applicable to clinical tests, average error and serial arrangement, the latter demands less co-operative effort. A very satisfactory series of subliminal differences in grays can be made with India ink, and the same method can be used for producing a series of subliminal differences in color tone. Gilbert describes a series of red wools used in the research above named, other methods for grays are described by Titchener (34). The sorting method, as developed by Henmon (35), is a convenient quantitative test of color sense, though as a technical point some sorting box as that described by Jastrow (36) should be used in all sorting experi-

ments, and the cards not piled one on top of another in groups. In sound intensity no experiments of any precision can be made quickly enough for clinical work, though the research technique is well evolved (37). In the perception of pitch (37, 38), tuning forks are preferable where they can be used. At present they are scarcely applicable save in the method of right and wrong cases; a convenient method for continuously varying the rate, as by means of a rider whose retarding influence could be varied by a micrometer screw, would much enlarge their scope. The simple pitch-pipe is altogether out of favor and the Appunn and Stern instruments are complex in operation. While a far from perfect experiment, the best method at present available would seem to be the monochord, as used in the Columbia Freshman Tests. The method is average error, the subject reproducing as nearly as possible from memory a standard tone.

Tests of cutaneous sensibility have a special pathological application in conditions of hysteria. The defects of the 1-2 point test have already been established, and the exploration of touch spots requires more co-operative effort than the subject can usually be relied upon to give. A more practicable method is that of the Graham-Brown (39) *æsthesiometer*, which is intended to measure the ability to distinguish rough and smooth surfaces. Probably the best principle, however, is that of the familiar pin head and point test, often also given with a pencil. The subject simply indicates whether he is touched with a sharp or blunt object, but the test could easily be reduced to a quantitative form. Passive perception of weight is also employed; in these cases the weights should be sufficiently large as not to introduce the question of touch spots. It is interesting that Rivers⁸ reports a considerable lack of correlation in the results of the different methods for the touch sense, as given in the experiments on the operated arm of Dr. Head. In this field, especially, is there uncertainty as to the function measured, which argues strongly for the test with the least mechanical sources of error. The muscular sense, as distinct from the sense of movement, provides a convenient experiment in the perception of weight by serial arrangement. The

⁸ In an address before the American Psychological Association at Chicago, Dec. 31, 1907.

weights, which should of course be similar in appearance, and with their centers of gravity at approximately the same point, may be conveniently and simply made with lead shot embedded in paraffin in wooden pill-boxes. The differences may vary from 2 per cent to 10 per cent; the writer has found 4 per cent very satisfactory. The graphic method is a refinement that is hardly applicable here. The test should prove of special clinical significance in the anomalies of muscle sense. The sense of movement, joint sense, or tendon sense, as one may prefer to call it, has a special clinical application in some of the motor disorders seen in tabes and general paralysis; the most elaborate technique is that of Goldscheider. Accurate tests sufficiently simple for clinical purposes are possible with the apparatus described by Fullerton and Cattell (40). An even simpler test is the drawing of a line, with the eyes shut, equal in length to a standard line, the length of which is limited. This is similar to the "perception of weight" experiment in the Columbia Freshman Tests, and would be quite sufficient to detect any coarse deficiencies in motor sense.

It is in the motor field that conditions are the most satisfactory from the technical side. As has been mentioned, however, the graphic method is required for nearly all accurate work, for which laboratory surroundings are necessary. On the voluntary side experiments are concerned mainly with force, speed, and accuracy. As a measure of motor power, the ergograph will subsequently be discussed at some length. The dynamometer, measuring the force of separate contractions, is a uniformly unsatisfactory instrument. The most patent objection is the different leverage allowed according to whether the hand is large or small, the fingers short or long. Some instruments are quite painful to use at maximum contraction, on account of the sharp edges with which they are provided. Nor is the calibration always trustworthy; I have seen records all the way from 30 to 70 kilograms made on different instruments by the same individual under similar external conditions. The relation between the right and left hands is the only determination which these instruments can make with even approximate validity.

Under speed, the tapping test should be included in all general series. It is certain, however, that very misleading conclusions

may be drawn from taking simply the average time, as has hitherto been the almost universal practice, over a number of seconds. The experiment must be made by the graphic method, and evaluated according to fatigue losses. It is one of the simplest experiments to understand, and one of the easiest in which to obtain a fair degree of co-operation. Where it is impossible to use special apparatus, its best correlate is probably the *m* test, the subject making as many continuous zigzag marks as possible during, say, five seconds. Of course this gives maximum rate only.

The speed of isolated movements has not, so far as I know, formed a part of any general series of experiments. And yet it may have a certain significance in the present field, owing to the disorders of this function that are occasionally present in the retardations. The bearing of the *Schriftwage* work upon this point is sufficiently obvious. Simple reaction time is hardly a suitable measure for a series of general tests. Everyone is aware of its great susceptibility to practice, the slowness with which practice is eliminated, and the great unreliability of the figures in its earlier stages. It is probable that at least 1000 observations are required for its sufficient elimination, and traces of it have appeared after many more than this. Technically, it is a difficult experiment to execute with the proper precautions, and on this ground much of the work done with it is open to the gravest objections. The same objections apply to discrete choice reactions, which have additional difficulties in the proper standardization of the stimuli.

The most satisfactory accuracy experiment is probably that known as the three-hole test, in which a subject plunges a stylus as rapidly as possible into three holes situated at the apices of an equilateral triangle, the stylus exactly fitting into each hole. It is very doubtful if this is complicated to any considerable extent with an independent function of speed. As with the tapping test the usual procedure has been to take the time required for a hundred adjustments of the stylus, but it probably ought also to be taken by the graphic method. Where it is necessary to perform the test without special apparatus the subject may make dots with a pencil inside of circles printed on paper to correspond with the holes. The operator may take the time required for, say, 50 touches, of which he must, of course, keep count. There is no

way to allow for dots outside the circle; the subject must simply be forcibly instructed not to make them. Another form not open to this objection is to have the subject dot with a pencil inside the squares of finely graduated (sq. .1 inch) cross-section paper, counting the dots which fall outside their proper squares. The speed of the dotting is governed by a metronome. The great difficulty is that different speeds of the metronome are required for different subjects. Many other tests are proposed, but they seem inferior to the above forms especially as regards ease of evaluation, the usual difficulty being insufficient control of the speed. The so-called "steadiness test," in which the subject endeavors to hold a stylus within a hole without touching the sides has little to do with motor accuracy, but is a rather crude measure of muscular tremor, registering the number of occurrences of a tremor of a certain extent.

If tremor is to be studied at all, and it is probably material for a research problem rather than for a standard test, some more precise means of recording should be employed. The usual instrument is of the myograph type; Peterson (41) speaks highly of the Edwards sphygmograph, but the high-water mark is probably reached in Sommer's tridimensional analyzer (6). Sommer reproduces some very interesting records made with this instrument, but we have yet to hear of a system of diagnostic entities based upon it, as Spearman seemed to forecast (42).

Among the higher mental processes the uncontrolled association experiment is one that has recently assumed a peculiar importance in the pathological field. Nevertheless, it is probable that the claims that have been put forward by Jung and the others of this group are of a character that should have been made on a basis of more careful experimentation. Technically, the method is very weak, and statistically it is by no means invulnerable. Still, the practical results have been far from negligible. Under the circumstances, it will probably be well to suspend judgment of the fundamental validity of the method until the observations are confirmed by some one with a little stricter conception of what constitutes experimental conditions, and meanwhile to heed the counsel of Gamaliel.

The first need is more precise measurement; the stop-watch is

out of the question for accurate work in this respect, just as the Hipp chronoscope perhaps errs too much on the other side. .01" is probably a sufficient unit of precision for association times. The chronoscopes all require special registering apparatus in the form of the numerous voice-keys that have been devised; Cattell's form, as modified by Watt (43), seems to be the most approved apparatus, but the writer has his doubts. I have yet to see a key operated by laryngeal action that can be depended upon with voiceless spirants, or a breath-key that works properly with the nasals or even the initial vowels. The lip-key and its modifications interfere with the vocal organs and have other technical defects besides being unæsthetic. A good deal is to be said in favor of the Bergström chin-key, though as far as I know it has not yet been extensively used. The graphic method is probably of greater accuracy than can be attained through chronoscopic means, but also of greater than is worth while, when its cumbrousness is considered. The above remarks of course apply equally to associations taken by the discrete method, whether controlled or uncontrolled.

So far as the continuous method is concerned the uncontrolled association is scarcely open to experimental treatment at all, and it is perfectly possible to obtain one's material in another way. The scattering of the dementia, the rambling of the G. P., and the flight of the manic equally await the hand of the skillful stenographer. The very incoherence of the talk, as well as its frequent indistinctness, render the task a difficult one; it may be mentioned that the phonograph is unsuitable for this work. In normal individuals it is a well-known experiment to have the subject write down as many unconnected words as possible in a given period. The resemblance of such lists to the manic flight has already been noted.

The field of controlled association has perhaps been the most prolific in the number of tests that it has produced. But we do not reap the full benefit of the continuous method in its ability to register episodic changes in the efficiency of performance unless we take account of the individual processes. To measure merely the average speed for the entire test, or the work done during each half-minute or minute entails a great loss of experimental effi-

ciency; the finer work-rhythms are lost as completely as in the discrete procedure. The reader may remember the ingenious electric pencil devised by von Voss (44) to meet this difficulty, but this adaptation of Wundt's *D* method of reaction has insufficient objectivity. The only satisfactory method is to make the direct response by some movement other than one of the vocal organs; this conclusion points to the chain reaction with choice as exemplified by the psychergograph, of which more subsequently.

The controlled association process can be cast into a convenient form for the ordinary clinical test, the time being read from a stop-watch at as frequent intervals as may seem desirable. Reading aloud is the simplest form, but the association is liable to go on more rapidly than the motor response is possible, as with the simpler arithmetical tests which have already been discussed. Other forms of the controlled association test are the synonyms, opposites, part-whole, genus-species, co-ordinate, sub-ordinate, and supra-ordinate objects and ideas, to name an attribute of the word exposed, or even to expose two words and have the subject state the relation between them. The tests just enumerated are a striking illustration of the point above made, that one could afford to pay less attention to the general function with which the test is related, and rather more to the details of its interpretation. None of them can be evaluated with any accuracy, because the control is only partial. More than one association is always possible, and the same association does not necessarily mean the same mental attitude in different individuals. As a measure of mental qualities, these tests are necessarily very inferior to the absolutely controlled associations such as the arithmetical tests. Among others to be recommended are the comparison between the ability to name and recognize colors or pictures, and the words naming the colors or pictures. It is usually found in literate persons that the word is named more easily, and retains its associations better than the color, picture, or object. Simple tests of this nature are frequent in mental examinations, especially for aphasic conditions, but they lack the standard character which alone permits of comparative study. Another good type of controlled association experiment for pathological work is that described by Packard (45), in which the subject sorted cards bearing nouns together with

cards bearing the proper attribute, as fire-hot, ice-cold, etc. Many of the symptoms with which the clinician has to deal have been loosely described as "association disorders," and for light upon their precise nature we are practically dependent upon experimental methods.

In clinical memory experimentation one is limited to the so-called primary memory, the *Merkfähigkeit* of the Germans. The tests in this type of memory fall into various classes, independently of the experimental technique. The simplest are those in which the subject is simply given visually or auditorily a series of homogeneous stimuli, as nonsense syllables, words, or figures, which he reproduces either immediately or after a given interval. The so-called letter-square method is a complication of this type. The tests are difficult to evaluate because there is no standard system of scoring the different types of errors, omissions, transpositions and substitutions. This lack of homogeneity in the errors is a difficulty in the scoring of all memory tests. Under associative memory might be classed those tests in which the stimuli are presented in pairs, and the problem is to later assign to one of each pair its proper mate. To this class belongs the *Treffermethode* of Müller and Pilzecker; the *Reproduktionsverfahren* of the association experiments is a special form of this procedure. Another class of tests deals with recognition memory; i. e., the ability to recognize certain objects previously presented among a miscellaneous group of homogeneous objects. This seems to be a fairly good form of clinical test, as evidenced by the amount of work done with it on the pathological side. The time required to learn by heart compositions longer than the individual memory span is hardly to be recommended for clinical purposes, demanding a high degree of co-operation, and the conditions being more difficult to control. Some form of "logical memory" test, i. e., reading a short connected passage and having the subject reproduce as well as possible the gist of it, forms a part of most mental examinations. While it lacks all standard character, it must be admitted that any one experienced in giving it can get a good deal out of the way it is reacted to. To what extent performance in the above species of memory tests may be correlated, does not seem to have been satisfactorily determined; it is com-

paratively certain that performance in the logical memory test is a very poor criterion of intellectual ability.

The special methods for associative and recognition memory devised by Ranschburg (46) and also described by Hoch (4) are the principal contributions from the pathological side. Ranschburg's additional prompting procedure as an index of the "certainty of memory" would seem to have a very real value, but the procedure is a delicate one and requires better control than Ranschburg uses. The wrong cases should not be the only ones in which accuracy is questioned. These methods, in a somewhat modified form, have been applied by Boldt (47), and Bernstein (48) describes a simpler recognition memory procedure, using geometrical forms. Brodmann (49) and also Krauss (50) have studied memory in polyneuritis, the former using the methods of Ebbinghaus, and of Müller and Schumann, and reporting an improvement keeping a general correspondence with the clinical recovery, though in many respects giving results that could not have been obtained by clinical observation. Neither is the influence of practice clearly brought out; in Krauss' case it seems to be absent. The pathology of memory has had a good share of attention in the recent work of Kraepelin's laboratory, other studies being those of Schneider (51) on senile dementia, and Wolfskehl (52) on manic cases. Both Krauss and Wolfskehl used Finzi's apparatus, which the more recent work of Kramer (53) on normal subjects abandons in favor of a pendulum tachistoscope. It may be mentioned that Kramer's results do not altogether confirm the normal data of Wolfskehl. Elsewhere the rotating drum seems to be the more approved apparatus. While the ordinary kymograph can be used, there are disadvantages in a constantly moving field and the inability to vary the time of presentation independently of the interval between presentations. In the special instruments the movement of the drum is controlled by alternating escapements operated by electromagnets; a new stimulus is exposed when a fresh circuit is closed. The instruments of Wirth (54) and Ranschburg utilize this principle; in the latter the stimuli are affixed radially on a rotating disk, in the former they are on the surface and parallel to the axis of the drum. The most evolved form seems to be the recent apparatus described by Bergström

(55), which includes a special device for varying the intervals of the contacts. There are several simpler forms of visual memory apparatus, but it is doubtful if they add materially to the accuracy that is possible without special appliances. The great advantage of visual over auditory presentation is the more rigid control to which it is subject, and this advantage is in a large measure lost unless instruments of precision are used.

In sum, I would for present purposes rank the usefulness of the subjoined tests, *as tests*, about as follows, each in their several departments.

SENSATION.

1. Weights, by serial arrangement (size-weight illusion).
2. A quantitative form of the pin-point and pin-head æsthesiometer test.
3. Extent of movement, by average error.
4. Length of lines, by serial arrangement (vertical horizontal illusion).
5. Grays, by serial arrangement.
6. Pitch, by average error, with the monochord.
7. A simple test of color vision (as that used in the Columbia Freshman Tests).

MOVEMENT.

Speed.

1. The tapping test.
2. *M* test.
3. "Isolated" movements.
4. Simple reaction time.

Accuracy.

1. The 3-hole test.
2. Same, with paper and pencil.
3. Dotted squares.
4. Hitting at series of dots. } Timed by metronome.
5. Maze test.

Force.

1. Fatigue of force, with Cattell finger ergograph (both hands).
2. Ordinary dynamometer (at least 3 trials with each hand).

Involuntary.

1. Tremor, by the graphic method.

HIGHER MENTAL PROCESSES.

Association.

1. 100-7 test.
2. *A* test.
3. Other arithmetical tests.
4. Naming colors.
5. Naming objects (pictures).
6. Reading aloud.

Memory.

1. Recognition memory, by Ranschburg's methods.
2. Immediate memory for simple presentations.
3. Associative memory (*Trefferverfahren*).
4. Logical memory.

So much is often left to be desired in the statistical presentation of results that a few words on this point may not be out of place. American practice has settled definitely on the average, with the m. v. as a measure of variability. A modicum of experience, however, suffices to show how entirely these figures may conceal the actual state of affairs. When the number of cases is, say, above 25, the distribution of all important averages or other statements of central tendency should be printed in detail, and in any case should be briefly described. Of course, any one who would print an average with the distribution of whose constituents he was unfamiliar, would be beyond the pale. The printing of a distribution seldom requires more than two lines, and ought to prove a healthy corrective for the ruthless throwing out of extreme cases which is responsible for so many small m. v.'s, particularly in reaction time work. We often tend to consider low variability as indicating careful experimentation, as it may in physical measurements, but in the present field it is much more likely to mean a rigid censorship of the results. There is no mathematical device that will make inaccurate measures serve for accurate ones, or few observations do duty for many.

Much of the importance of all experimental work lies in the study of correlations. For present purposes something may be sacrificed for a measure of relationship in a form intelligible to the unmathematical reader. This is hardly true of the standard *r* or the Spearman correction. Simpler measures are Thorndike's (56) median ratio, Spearman's "footrule" (57), and the method of per cent of like signs described by Whipple (58). Of these three, the writer can claim experience only with the last named, which is simple and accurate, but does not seem to work well with small arrays, for which the Woodworth per cent of displacement is far preferable (59, 60). *Per contra*, this latter is rather cumbersome in large arrays, but is perhaps the most simple and intelligible in its rationale.

ORGANIC PROCESSES.

A few words must be said here regarding certain processes that may not be closely related psychologically, but whose similarity in experimental approach brings them together for present purposes. I refer to the study on the one hand of the emotions, on the other hand of the complex processes summed up under the name of attention. With both of these the plethysmograph has strong historical associations, and analogous instruments, such as the sphygmograph and the pneumograph, have found employment in both fields. It is very questionable, however, whether for the study of the emotions, at least, the plethysmograph has any scientific application in pathological territory. Not alone on technical grounds should such objections be maintained, for although these are very great, and have led to the questioning of the validity of the plethysmograph, from a purely instrumental standpoint, as a reliable index of emotional states, yet it is probable that in the latest developments these difficulties have been well met, and that the registration of a sufficiently accurate volumetric curve is a perfectly possible thing. But when we come to correlate these phenomena with emotional states we are face to face with an entirely different problem. It will be difficult to formulate a satisfactory answer to the objection of McDougall (61) against any vaso-motor criterion of mental states because the relation of these centers to the nerve supply of the vaso-motor system is too complex and ill-understood. Moreover, and what is perhaps more to the point, the plethysmograph has not shown itself in any sense of the word a "psychoscope." As a measure of emotions, the most recent opinion seems to regard it as practically bankrupt. There is no space here to point out the sources of error in the method to which this condition may be ascribed, for which the reader is referred to the special studies (62-66), but the present attitude of normal psychology, where 90 per cent of the work has been done, justifies considerable caution in accepting the clinical significance of contributions from the pathological side.

The most recent of the extended studies in this field, that of Alechsieff (67), discards the plethysmograph for the sphygmograph and pneumograph with a claim of some positive results. The galvanometer, also, has again come to the fore as an index

of emotional states. In the work with this instrument on the clinical side with which the writer is familiar, the problem seems to have been approached from the last of empirical standpoints, with next to no control of the physiological factors immediately involved. It is, therefore, impracticable to make any technical criticism of the method, or estimate of its possibilities.

If we confine ourselves to an objective definition, the field of attention offers greater promise from a methodological standpoint. We have here at least definite phenomena like the Traube-Hering wave, in relation to which the efficiency of the various vital functions can be studied. On the motor side, Van Biervliet (68) has examined the relation of reaction time to pulse rate, Patrizi and also Wright (69) its relation to the Traube-Hering wave. Noyes (70) studied the relation of the patellar reflex to the Traube-Hering wave in a single case of terminal dementia. The results of the last three named can be brought into some degree of accord; their relation to Van Biervliet's work is not altogether clear. Nor do the experiments of Slaughter (71) and also Bonser (72) on the sensory side correspond very well with these results. The researches named can hardly be regarded as other than *Bahnbrechend* for the problem; the technique has been vastly improved since they were made, and more conclusive results may be awaited with confidence.

FATIGUE.

When a bullet leaves a rifle barrel, its flight is determined by several forces, as the propulsive force of the powder exploded behind it, the resistance of the air, and gravity. When we set out to produce a work curve our performance is similarly acted upon by forces of infinitely more complex character. Such are the energy that continues the work, the various phenomena associated with the names of practice, fatigue, warming up, minor rhythms, and episodic heightenings of efficiency that are described as "impulse" or "effort of the will," though their relation to consciousness is far from clear. When we recollect how complex is the calculation of a bullet's flight, immediately dependent though it be upon measurable and well understood physical conditions, and then consider the infinity of variable, unmeasurable, unanalyzable

factors that influence the curve of work, it must be apparent that, however faithfully we may describe them, the explanation of its phenomena is from the logical standpoint a nearly hopeless task. We observe an initial increase in efficiency, we call it "warming up." We observe a gradual decrease in efficiency; we call it "fatigue." We observe a sudden rise in the curve with no traceable external cause; we call it *Antrieb*, "effort of the will." But we must not unqualifiedly speak of these phenomena as *due* to fatigue, warming up, or impulse, or we are using as an explanation of a fact what is only an inference from it. Many causes may be, individually or collectively, responsible for any of the phenomena which we sum up under these names. Another theoretical point confronts us. The distinction between *Ermüdung* and *Ermüdbarkeit*, between condition of fatigue and susceptibility to it, is of great clinical importance, and is often drawn more sharply in theory than in practice. The only criterion is the shape of the curve. Given the shape of the known normal curve, we may infer conditions of fatigue from a relatively low performance of relatively constant level, and susceptibility from an abnormally sharp descent of the curve. But chief among the causes of progressive loss in efficiency is often not an objective wearing out of the apparatus involved, but the reflex inhibition arising from sensations of fatigue. It has been noted that by removing related sensations, as with bromide, efficiency may be actually increased over the normal. So that, to consider only the most superficial factors, a high susceptibility to fatigue may be due either to a rapid wearing out of the machine, or a ready response to the reflex inhibitions.

We must not lose sight of the fact that there are many sources of error in turning, from either the educational or clinical side, to any single test as a measure of fatigue. It is reasonably certain that different functions do not correspond in the character of their efficiency losses; the same state of fatigue that is indicated in the loss of efficiency in one function may be accompanied by a gain of efficiency in another, and of the complex and delicate interplay of these gains and losses but little is understood. At the same time, it is necessary from a practical standpoint to confine ourselves as far as possible to a single measure, assuming that the fatigability of equally practiced functions is equal, and that an accurate deter-

mination in one function is of approximate general validity. So far, this assumption is unestablished empirically, but almost every worker in the field has made it, and must continue to make it until an accurate investigation of correlations in fatigue phenomena is at hand. It is from this point of view that we must consider the various methods of measuring fatigue that have from time to time been proposed. It is safe to say that none of them are shown to measure an abstract "fatigue," whatever the claims of their originators; to what extent they measure progressive changes in efficiency in the function to which they are supposed to be related, is another, and itself sufficiently difficult question.

The experimental study of fatigue falls into two main divisions. First, the study of the changes in efficiency in continuous work, as measured by actual performance in the work itself, and secondly the search of a convenient test to measure the loss of efficiency due to continuous work of a general character, as school work. With regard to this second problem it need only be noted that if any test, say the addition test, is a measure of a general fatigue, say fatigue of school work, the adding function must itself be affected by the general work, so that the surest criterion of the state of fatigue is the shape of the fatigue curve given by the test. If we know the course of the normal curve, the relation between it and the curve obtained in the test represents the condition at the time it is obtained. For present purposes, therefore, the second problem largely merges itself in the first.

In the usual classification, one may speak of measures of fatigue as sensory, motor, and intellectual. Marsh has reviewed these in some detail, and only the more important points need be mentioned here. The school problem gave the impetus to the researches that resulted in the formulation of the Griesbach method (73), based upon the 1 and 2 point dermal threshold, determined with the æsthesiometer. As with the plethysmograph, the most extravagant claims were made for it, and even more hopelessly, if possible, have they fallen to the ground. The method has been tried out thoroughly, with much greater fatigue conditions than Griesbach's, apparently also with more careful experimentation, by Leuba (74) and by Germann (75), failing to give positive results. More recently Bolton (76), as the result of a very careful and

extended research, comes to the same negative conclusion. Theoretical considerations have also been adduced to show that this threshold has scant objective significance. The test is sometimes used for clinical determinations of cutaneous sensibility, but it cannot be too quickly discarded, in favor of some direct areal or pressure test.

Measures of sensory fatigue would be very difficult to make on pathological subjects, and their correlation with other fatigue phenomena is more than doubtful. On the motor side the work done with the ergograph overshadows all else, especially in the pathological field. But brief mention need be made of the methods for the other functions. The experiments of Cattell disclosed no great susceptibility to fatigue in reaction time, and these results are to a certain extent confirmed by those of Bettmann (77) and Patrizi. However, these results were taken by the discrete method, which might well allow sufficient interval for recovery. To obviate this difficulty, Scripture (78) used the graphic method with a very rapid succession of stimuli, finding a considerable fatigue effect. As Woodworth (79) remarks, however, Scripture was unfortunate in his choice of stimuli, the light used being extremely fatiguing to the eyes, and this would probably tend to lengthen the reactions irrespective of a specific reaction-time fatigue. The speed of repeated movements (tapping test), is quite subject to fatigue, so much so that it cannot be left out of account in any determination of performance over 5 seconds in length. The writer is at present engaged in an extensive study of the fatigue phenomena of this function, which indicates certain clinical possibilities. The accuracy of movement is not very subject to fatigue, and nothing of clinical importance has, to the writer's knowledge, been brought to light on this point; the fatigue of isolated movements does not appear to have been studied, independently of its relation to the tapping test.

This brings us to the ergograph. Historically, this instrument appears in two forms, the weight apparatus originating with Mosso, and the types of spring ergograph introduced by Cattell and by Binet and Vaschide. The former instrument has been one of the most important instruments of Kraepelin's laboratory, and has also become familiar to American readers through the work

of Hoch (80), who still further improved the technique. A most valuable improvement is the ratchet feature, which obviates the distressing back-pull against the finger, while facilitating the calculation of the total work. A good deal of this work, however, seems to have been done with very insufficient regard to the well-known fact, that the Mosso principle in its usual application—lifting a weight until it can no longer be lifted—does not and cannot give anything in the nature of a true “exhaustion curve.” At the end of a Mosso record, the muscle does not fail to contract for fatigue, but it simply does not contract with sufficient force to raise the attached weight; a lighter weight it will raise. With these facts in mind, it is difficult to see how such an interpretation as that of the relative independence of number and height of contractions (*Hubzahl* and *Hubhöhe*), the former related primarily to nervous and the latter to muscular fatigue, could ever be put forward with sufficient assurance to serve as a basis for clinical deductions. No single Mosso curve gives independently the number or force of innervations which may be transmitted to a muscle. It does indicate in a very striking and objective way the point at which a certain loss in efficiency is reached; but to separate, on the basis of the present evidence, two functions like *Hubzahl* and *Hubhöhe*—which must in the nature of things be largely functions of each other—and to speak of one as conditioned by muscular, the other by nervous states, is little less than dogmatism; a *stratagemme*, as Woodworth’s translator not ineptly put it (81).

It was to obviate some of these limitations of the Mosso instrument that the spring ergographs were devised. The detail of the advantages of the isometric over the isotonic method has been reviewed by Franz (82), and it may perhaps be emphasized that not the least mechanical advantage in having the curve as nearly isometric as possible lies in the fact that the leverage is more constant. This is not at all the case with the Mosso instrument, in which the first and last third of a full contraction are usually much harder than the middle. In the spring ergographs the fatigue curve shows the warming up, and gradual decrease, but does not diminish to zero, becoming asymptote to the baseline when a certain fraction of the original height is reached, and remaining thus indefinitely, save that one occasionally finds certain rhyth-

mical rises and falls that remind one of the vasomotor waves. The records with these instruments are more difficult to standardize than those from the Mosso, as the work done must be read off from a special scale adapted to the spring employed. A small and very convenient type of ergograph for clinical work is that used in the Columbia Freshman Tests. This instrument, however, makes no provision for the elimination of most of the muscles of the hand, and the subject must be constantly watched to prevent his bringing other fingers into play.

As an instrument of precision, there is probably no form of ergograph which approaches that described by Bergström (83). The principal features of this apparatus are (a) elimination of gross body movement through suspending the ergograph by a spring instead of having it clamped, (b) adaptability to the use of either spring or weight, (c) great flexibility in the number and character of muscular contractions to be measured, (d) superior control of actual muscles used, (e) separate devices, contained within the instrument itself, for recording and adding the fatigue curve and for giving immediately the height of the separate pulls. Technically this instrument is in a class by itself. To obtain an idea of the complexity of ergograph work, and the numerous sources of error that are encountered with the ordinary instrument, one can do little better than to consult Bergström's paper. Whether it is worth while to take ergograph records by simpler means, regardless of these errors, we must judge empirically. Trèves, Féré, Maggiora, and most Kraepelinian workers appear to place considerable confidence in them, Joteyko treats the Mosso curve almost like a micrometer scale; Franz, Bolton and Miller, and others, who have laid more stress on the methodological aspect of ergographic experiment, are apparently less convinced of the ultimate value of such measurements. The results are rather difficult to evaluate; Joteyko has been the most prominent in this field, but few will be able to understand the significance of the curve without presentation in its entirety.

On the whole, ergographic experiment is in a far from satisfactory stage theoretically, and as yet it has received no sufficient empirical justification. We do not even know to what extent nerve and muscle operate in the loss. This further impairs its

value as a psychological experiment. It is probably too much to expect a measure of any general value from a partial determination of the work capacity of certain isolated muscles. In this connection will be remembered the searching criticism to which the entire subject of ergographic procedure has been subjected by Robert Müller (84), and it is a matter for note that a method with such scanty empirical support should have served an applied psychology in many of its most fundamental researches.

For much of the work on fatigue in the higher mental processes the educational problem is again responsible. The tests of the higher mental processes are much the most convenient for this purpose on account of their usual availability for group tests, though this factor is clinically of almost negligible importance. And Kraepelin (85) is doubtless justified in insisting that group experiments cannot be made sufficiently accurate for these purposes, and in favoring the use of standard and precise measures under the strictest experimental conditions. There is no space to dwell at length on the *Kombinationsmethode* of Ebbinghaus or the suggestions of Ritter, Friederichs, and Burgerstein, whose aim is the detection rather than the study of fatigue, and whose bearing is mainly educational. The pathological bearings of the *Kombinationsmethode* have been studied by Ziehen and further indicated by Wiersma (86); its main fault is its lack of precision. But as the ergograph has been supreme as a means of studying motor fatigue, so has the addition experiment as developed by Kraepelin, held practically the entire field in the higher mental processes. Some form of the arithmetical association is certainly the proper means of experiment in this direction, and while no one would claim technical perfection for Kraepelin's form, it is probably as good as any of the simpler tests, quite apart from its enormous historical advantages. A rather serious technical dilemma confronts us here. When the character of the individual processes is noted, as ought to be done in pathological work, we complicate the mental process of addition with the motor process of noting down the result, and in an easy test this motor factor is so much slower than the mental as to considerably retard it, thereby introducing a large error into the results; the subject adds faster than he can write or even speak the answers. On the

other hand, if we use more difficult tests, such as involve subtraction, multiplication or division, the mistakes are no longer the negligible factor that Kraepelin considers them in the addition test.

Accepting the addition test as a fair measure of the fluctuation of continued work, Kraepelin analyzes with great acuteness the various factors that influence it (87). Indeed, if a criticism may be ventured, it is that his viewpoint is, if anything, rather schematic, tending to interpret the curves too invariably in terms of a fixed system. By this is meant especially the recourse to such terms as *Antrieb*, *Willensspannung*, and others that assume a special influence of conscious activities on the curve. Of the significance of such terms as *Günstige Pause*, *Gleichgewichtspause*, etc., there will of course be no question, but their determination is fraught with stupendous difficulties, and it may be doubted whether the experimental conditions have been or can be sufficiently controlled or refined as to afford a satisfactory empirical demonstration of the analyses here formulated.

In this connection must be mentioned the extensive clinical study of Specht (88). The data consist of normal determinations and experiments on traumatic neuroses. The experiment is a comparison of the curve of 10 minutes' continuous adding with the curves of two continuous additions of 5 minutes each, with an intervening 5 minutes' pause, the two types of curve being made on alternate days. Five of the six pathological subjects tested showed an excessively great fatigue loss, *i. e.*, susceptibility to fatigue, the sixth practically none at all. The total efficiency is very low, sometimes barely a tenth of the normal, so that the curves present at first sight a rather deceptive appearance. There can be no question that the results of the normal and pathological cases show statistically two distinct species. The neuroses seem also to be less benefited by the insertion of the pause. Both in the method and results are many points of great interest, for which the reader may be referred to the paper itself. The concluding experiments on *Absichtliche Verstellung*, however, are perhaps a little premature. Motive is a difficult thing to prove, in psychological investigation as elsewhere, and experiments in this direction must be better controlled than those described in this connection.

Moreover, the whole theory of the measurement of fatigue through the higher mental processes receives a serious check through the work of Thorndike (89), who succeeds in accounting for practically the entire body of fatigue phenomena as observed with the addition test upon conditions far other than an objective decrease in mental ability. Under the most rigid conditions of co-operation longer periods than used, say, in Specht's work, could be gone through without showing any fatigue at all. Equally negative are the results of various mental tests applied to detect the presence of fatigue during the course of school work. The results of Thorndike's papers justify a good deal of scepticism as to the value of experiments in the higher mental processes as a criterion of either condition or susceptibility to fatigue. Although it cannot be denied that significant results have been obtained with these methods it will probably be found desirable to return to some form of the motor measures, on account of their objectivity and above all their greater precision.

From this generalization must be excepted the too little recognized psychergograph of Seashore (90). The subject is given a stimulus to which he reacts in a prescribed way, his reaction movement serves to expose another stimulus to which he reacts in another prescribed way, this again exposes a third, etc. This experiment is probably the broadest in scope of all psychological tests, and when it is remembered that all life is essentially a series of chain reactions with choice, it becomes also one of the most intimate experiments that can be constructed. The standard instrument of the psychergograph type uses four visual stimuli with corresponding reaction movements, the time of the individual processes being measured on a ribbon kymograph to a precision of .01". The uses of such an instrument are too various to be entered into here, but its nearest pathological application would seem to lie in the field of psychomotor retardation. It is unapproached as an experimental measure of the process as a whole, though of course it does not analyse out the factors; separate experiments on the various functions are necessary to do this. There is no reason why such an instrument could not be constructed to register the force of the reaction movement, if this is of the significance that the *Schriftwage* experiments indicate it to be. Two

reaction movements (right and left hand) should probably suffice for ordinary use; the most advantageous form of stimulus could be determined only by experiment. It is striking that this general principle has been so little applied, in the presence of the inferior methods with which the literature is replete.

We have seen how essential it is that we take fatigue curves at no more than their face value, and how practically the entire result is given us immediately in the shape of the curve. This subjects all fatigue work to another special limitation. All fatigue experiment, indeed almost all psychological experiment itself, depends directly on the making by the subject of certain maximal efforts. Everyone with laboratory experience knows that this "maximal effort" is a form of words that is interpreted in different ways by different people. This is a most potent factor in determining the shape of a fatigue curve. To illustrate: we are measuring with an ergograph the strength and endurance of a subject's middle finger. The maximum initial effort of which the muscles are capable let us term F . Of course no matter how willing or conscientious our subject may be, we never get this F ; we get only 60, 75, or 80 per cent of it, as the case may be.* From two subjects of absolutely equal strength and endurance we shall get very different looking fatigue curves, according as they put forward 60, 75, or 80 per cent of F . 80 per cent will do much less work than 60 per cent, just as the runner who runs at full speed will not run half as far before exhaustion as he who travels at half speed. Now we have no means of knowing whether the actual effort that we get as "maximal" is 60, 75, or 80 per cent of F . It is probably a grave mistake to regard this as entirely or even mainly dependent upon the conscious co-operativeness of the subject; equally conscientious subjects may put forward very different degrees of the physiological maximum, and their fatigue curves will be influenced accordingly. For this reason I am inclined to believe that it is possible and legitimate to weight fatigue curves to a certain extent. It may be presumed that where the initial efficiency is greater, we are getting a greater percentage of

*It is even possible that in the case of a fatigue experiment we get less initial efficiency than in the case of a single effort; the subject instinctively "saves himself."

F, and our ideal conditions are being more rigidly complied with, consequently such curves are the more comparable. I have in normal individuals almost invariably found the most typical fatigue phenomena associated with the greatest efficiency of performance and vice versa, and it is probably fair to apply the same criterion to pathological records.

CONCLUSION.

But more than all, pathological psychology must comprehend, equally with normal psychology, the advantages of dealing with data in the mass. Extended investigations with single subjects have their legitimate place in the development of methods, and must long play a useful part in the literature, but it should be borne in mind that their results have strict application solely to the individual from whom they were obtained, and can only with great caution be applied to the class to which the subject appears to belong. Such studies are valuable because of the clinical understanding of the individual cases that they give us; but the attempt to generalize from such observations to a clinical group is likely to lead to nothing but error and confusion. If in pathological psychology we should deal not with individuals, but with cases, we may look forward to the time when we may deal not with cases but with diseases.

At present, the necessary conditions for these investigations are scarcely to be obtained save in the research laboratories of the insane hospitals. At the same time, the special training requisite for carrying on such work is hardly to be had outside of the laboratories of the larger universities. Pessimistic opinion has been expressed as to the possibility of direct co-operation between these two, and there are indeed many conditions which tend largely to justify this standpoint. Much more essential is the constant co-operation of clinician and psychologist under the former conditions. The fields of psychiatry and experimental psychology are too rapidly growing, and the details of knowledge that they require are too minute that either clinician or psychologist should be more competent than his fellows in both. Without the clinician, the psychologist cannot have a proper understanding of clinical problems or interpretations, and without the psychologist, the

clinician has hitherto been exposed to the gravest errors of experimental practice. Much of the previous failure of psychological methods to justify themselves in psychiatry can be accounted for upon purely technical grounds, which ought to disappear as the co-operation of the two sciences becomes more and more immediate. Lines of communication are becoming better and better established; but the vast *hinterland* that is common to both sciences remains as yet unpenetrated. To many, it is still the "*never-never*" country of which Kipling has written. Of course we shall not know what it contains until we explore it, but the equipment lies ready to hand, and upon the facilities for the work being commensurate with its opportunities, the future progress of both sciences may in no small measure depend.

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CYST OF DURA MATER OCCUPYING THE LEFT MIDDLE CRANIAL FOSSA, ASSOCIATED WITH ANOMALOUS DEVELOPMENT OF THE LEFT SUPERIOR TEMPORAL GYRUS.

By JAMES B. AYER, JR., M. D.

(From the Pathological Laboratory of the Danvers Insane Hospital.)

I. INTRODUCTION.

The present report deals with a peculiar lesion of the dura mater found at autopsy in an aged man. This lesion, unsuspected during the patient's life, was a cyst in the dura mater of the left middle fossa. Despite the absence of related symptoms during life, the condition is regarded by the writer as congenital. The paper deals, on the one hand, with the possible nature of the apparently unique cystic lesion and discusses, on the other hand, its peculiar effect upon adjacent nerve tissue. Wholly quiescent at the time of its discovery, the cyst had effected displacement of the tip of the left temporal lobe which was accompanied by a remarkable thinning of a part of the superior temporal convolution on the side of the lesion. This thinning of the superior temporal convolution is the more remarkable because the intervening convolutions (second and third) remain intact. Thus, if the thinned convolution is in any way due to pressure by the dural cyst, that pressure must have been exerted at some distance. This circumstance, if proved, would tend to show that convolutions differ in their capacity to resist pressure. Convolutional variations of this character have much to support them *à priori*; but little absolutely convincing evidence exists on the point.

II. CLINICAL HISTORY.

J. L. S., a man, aged 85, native of Massachusetts, single, was admitted to the Danvers Insane Hospital September 8, 1905.

There was obtained nothing of importance in his previous history or habits. One brother was insane for a number of years.

The Record at Entrance.—The patient had done little work for the past fifteen years. For the last four years before admis-

sion hearing had been poor, and for three years eyesight had failed. Always considered odd and stubborn, he had for the past three years developed a habit of running out onto the streets thinly clad and losing himself. He had a period of confusion for a long time when he was unable to find his way about the house. His speech was thick for a while, improved, but has had repetitions. Memory has become very poor; he is now untidy and indifferent. Has had several falls, after which he is found lying on the floor.

Examination shows a feeble old man, fairly developed and nourished. There are dulness and moist crepitant rales at bases of both lungs behind. Heart is slightly enlarged. Sounds are irregular, no murmurs. The tension of the radial arteries is increased, and all the palpable arteries are markedly sclerosed. There is edema of feet and ankles. Urine shows few hyaline casts with cells and granules adherent, but no albumin.

No paralyses noted. There is a gross tremor of hands and tongue. Patient unable to stand in Romberg's position. He is almost blind and deaf. Reflexes almost normal. Sensations not markedly disturbed. Four days after entrance he answered relevantly when questions were understood.

January 10, 1906. "Patient has been confined to bed since last note, and has shown practically no change in his mental condition. For the larger part of the time he has remained quietly in bed. He appeared as well as usual yesterday, and died suddenly during the night."

Diagnosis.—"Senile Arteriosclerosis."

Summary.—An old man, one of whose brothers is insane, gradually develops an inaptitude for work, failing in vision and hearing, and showing a loss of memory. He has had a period of confusion, occasional thickness of speech and, just before admission, several falls. Examination shows marked sclerosis of all palpable arteries and an affection of the bases of both lungs behind. Mentally dull.

III. AUTOPSY.

Anatomical Diagnoses.—Dr. E. E. Southard.

General arteriosclerosis.

Chronic fibrous myocarditis.

Slight mitral sclerosis.
Calcification of aortic valve.
Emphysema and edema of lung.
Hypostatic pneumonia.
Lymphatic cysts of intestinal wall.
Congenital cysts of kidney.
Double hydrocele with chronic periorchitis.
Aneurysmal dilatation of common iliac arteries, and of right vertebral and basilar.
Absence of diploë.
Chronic adhesive pachymeningitis.
Cyst of dura mater.
Edema and pigmentation of cerebral cortex.
Chronic leptomeningitis.
Congenital hypoplasia (?) of left temporal lobe.
Lung shows streptococcus pyogenes in pure culture.

Examination of the Head.—"Scalp normal. Calvarium shows little diploë. Dura inseparably adherent to vault. Sinuses contain fluid blood. The floor of the middle fossa of the skull on the left side is occupied by a flat sac-like fibrous bag, formed by a cleft in the dura mater. The dura mater strips readily from the temporal bone and from the Gasserian ganglion beneath. There are no interadhesions of sac and overlying pia mater. The sac is lens-shaped, with walls a little thinner than the dura mater of the opposite middle fossa, used for comparison, and contains about 10 cc. of slightly opalescent liquid. The inner lining of the cyst is smooth, but shows a few smooth trabeculae near the periphery. The gross appearance of the inner lining recalls that of the venous sinuses of the skull after withdrawal of blood. There is no free communication between the cyst and surrounding cavities, and the cyst was readily dissected out intact. At one point in the outer wall is a focus of recent hemorrhages and laking of blood occupying an area 1.5 cm. square. Along the inner wall is a linear collection of glistening flakes of miliary or slightly larger size, occupying a space 2 x .5 cm. Dura elsewhere normal. Arachnoidal villi moderately developed. Pia mater thickened and hazy, particularly over upper and anterior surface. The left frontal pole shows the most extensive pial thickening.

The pia of the mesial and inferior surface of the brain is almost normal in thickness and appearance. No thickening or other lesion can be noted over the tip of the left temporal lobe The left temporal lobe is shorter, flatter and more blunt than the right. The absence of material corresponds with the dimensions of the cyst of dura mater mentioned above. The sulcation of the region corresponds roughly with that of the other side. There is no tendency to microgyria. After removal of pieces for histological examination the brain was placed en masse in formalin."

Miscroscopic.—Cerebral cortex, right and left, frontal region: Increase of neuroglia cells in white matter. Pigmentation of nerve cells, neuroglia and adventitial cells is generally marked.

Ascending frontal: In places a decrease of Betz cells, and generally an increase in neuroglia cells, especially along vessels, where considerable pigmentation of glia and adventitial cells is noticeable.

Left calcarine: Pigmentation of glia cells, but not of nerve cells. Increased number of satellite cells and of cells in the outer layer.

Right calcarine: Relative increase in number of vessels in white matter.

Spinal cord shows a mild grade of stationary fibrillar gliosis of the posterior columns. The anterior spinal arteries in all levels examined show reduplication of the elastic membrane.

IV. EXAMINATION OF THE BRAIN.

It was perfectly evident at autopsy and in the hardened specimen that there was loss of brain substance, but just what part and how much was gone was not at first clear. A careful examination was therefore made to determine in what respect the left temporal lobe was smaller than the right.

On the left, the hippocampal gyrus extended anteriorly about 2 cm. less than on the right, and was somewhat depressed; but the breadth seemed increased. On section the convolutions of the cornu Ammonis appeared somewhat simplified and its anterior-posterior length was markedly shortened, being 2.0 cm. on the left, and 2.8 cm. on the right.

The amygdala was nearly equal in size on the two sides, 1.0 cm. on left, 1.2 cm. on right, anterior-posterior diameter. On the

left side, however, there was evidently a considerable dilatation of the ventricle, which separated the amygdala from the dentate lobe by 3 to 5 mm.

The third and second temporal convolutions, while of course not showing normal gyrations, seemed not to have lost much if any substance.

The first temporal convolution, curiously enough, because of its distance from the cyst, showed the greatest change. In the region of the supramarginal gyrus it is of normal appearance, but beginning about the level of the post-central convolution, some 5 cm. from the tip of the temporal lobe, it becomes gradually attenuated until it comes to an end 1 cm. posterior to the tip instead of normally rounding it and entering into its formation.

For microscopic comparison pieces were taken from the first, second, and third temporal gyri and the hippocampal gyrus of each side, and stained according to the following methods: With eosin and methylene blue, with methylene blue, Mallory's connective tissue stain, for elastic tissue, Marchi method for fat, Weigert's myelin sheath stain, for neuroglia with phosphotungstic-acid-haematein.¹

The hippocampal gyri differed much in gross arrangement of structure. A superficial microscopic examination suggested, however, that there was no great disparity in quantity of nerve cells or fibres, in fat content, or in neuroglia tissue, on the two sides. A thorough study was, however, not made.

Third and second temporal convolutions: Rough measurements showed the cortex on the right to be a very little deeper than the cortex on which the cyst rested. The cell and fibre content of the two sides appeared, however, little different. There was no excess of fat on the left either zonal or in deeper layers, and neuroglia tissue was not greater in amount.

The first temporal gyri, which showed such marked macroscopic differences, were made the subject of a more detailed study. Camera lucida drawings were made of the cortices after the manner of Campbell² in methylene blue and Weigert preparations, the conclusions reached being that: (a) The tip (i. e., the present tip) of the first temporal gyrus showed a narrowed cortex with slight deficiency of nerve cells; (b) A short distance

from the tip (approximately 2 cm.) the cortices were of equal depth and the nerve fibre content was equal on the two sides or possibly even a little greater on the left, the fibre arrangement being identical.* There was no excess of cortical neuroglia, but rather more fine droplets of fat along the whole circumference on the left. This perhaps is no more than one would expect, for in every place where two cortices came together in the sections studied there was found slight zonal deposits of fat, and it is seen here that the left first temporal gyrus is touched on all sides by cerebral cortex.

In most of the sections a greater or less amount of endarteritis was evident, and fat in small droplets was common in the walls of, and about, capillaries and small blood-vessels.

One small encapsulated point of hæmorrhage was found in the white matter of the superior right parietal region.

Description of Cyst.—Outer wall is old but thin fibrous tissue, showing no active cell process. The inner wall, however, is lined by large-celled connective tissue, the nuclei large and prominent, the fibrils deeply staining with eosin.

No echinococcal hooklets.

Chemical examination of the cyst contents showed a substance soluble in ether, probably either cholesterin or fat.

Summary of Findings.—A cyst of the dura mater, either congenital or of long standing, has caused distortion of growth of the left temporal lobe and neighboring structures, with partial aplasia of the left first temporal convolution. Strangely enough the convolution most affected (T_1) does not at any point come in contact with the cyst, and the missing part of the lobe, if present, must have been separated from it by two other convolutions which appear to be structurally almost normal.

V. DISCUSSION OF FINDINGS.

Four interesting questions are brought out by the autopsy findings:

1. Is the cyst congenital or was it acquired during life?

* Unfortunately the difference in fixing for the two methods here employed made it impossible to obtain cell and fibre pictures from adjacent sections.

2. Consequent on 1, is the small size of the first temporal convolution accounted for by hypoplasia or atrophy?

3. Why is the first temporal convolution so unduly affected by "pressure at a distance"?

4. What are the bearings regarding cerebral localization?

1. *Origin of Cyst.*—I have been unable to find in the literature descriptions of cysts comparable with the above. Most of the cysts mentioned are not in the dura mater at all, and are generally readily recognized as due to blood extravasation or to echinococcus, in the second of which conditions multiplicity is likely; so that conclusions with regard to this cyst will have to be derived without analogous cases.

With regard to the origin of the cyst:

(a) In favor of its being congenital, we find that the cyst is nowhere strongly adherent but may be stripped out, that there is no external or internal pachymeningitis, that the cortex of the temporal lobe is either normal or shows evidence rather of hypoplasia than of atrophy.

(b) Against its being congenital, there is microscopic evidence of an active process on the internal wall, there is chemical evidence of a chronic process; no mention is made of indentation of the temporal fossa, which might be expected if congenital, and etiologically it would seem to be a more likely location for an encapsulated hæmorrhage than for a congenital cyst.

We are therefore unable to state definitely the origin of the cyst, but think the origin may well have been congenital, and that it was subsequently the seat of slight internal inflammation.

2. *Is the First Temporal Gyrus Atrophic or Hypoplastic?*—There is no evidence macroscopic or microscopic, existing at the time of death, to favor the theory that the cortex has atrophied because of pressure. On the contrary the portion of the cortex which would be expected to show the greatest change, i. e. the region underlying the cyst, appears nearly or quite normal, whereas 2 cm. distant from the cause of pressure brain tissue is missing. (Other possible causes explaining the condition of T₁ may be adduced, but seem altogether unlikely in the presence of such a definite cause as the cyst.)

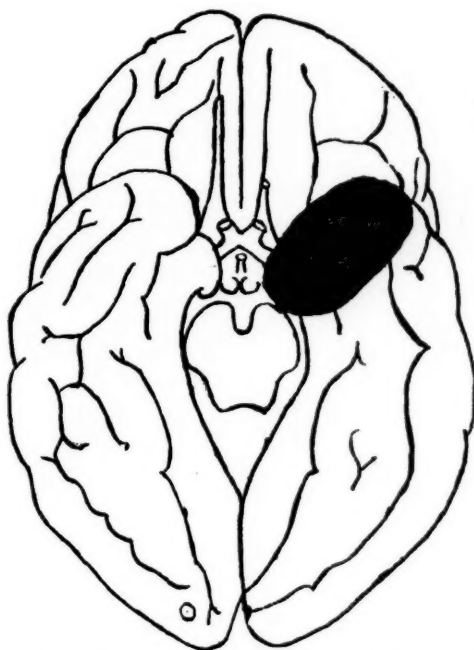
Putting considerations Nos. 1 and 2 together, *the evidence most favors a congenital cyst associated with cortical hypoplasia.*

3. *What is the Cause of "Pressure Hypoplasia at a Distance"?*

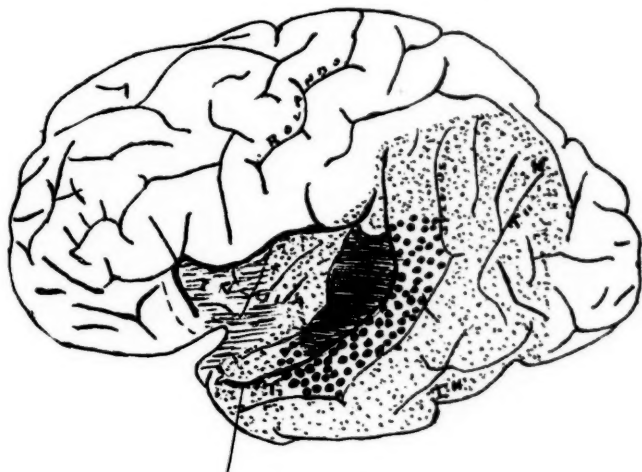
—The answer would seem to be that the character of the first temporal convolution must be different from that of adjacent tissue; it would seem either that the circulation was defective (which does not appear to be the case), or that the chemical or aqueous composition of T_1 was more susceptible to pressure changes than that of T_2 or T_3 . It is hard to realize that pressure exerted through a mass, 80 per cent of which is water, should not be equally distributed and equally destructive to all brain tissue.

4. *Problem of Cerebral Localization.*—Campbell⁹ found five cases^{10,11,12,13,14} where involvement of the left temporal lobe seemed associated with one or another form of deafness, but in these cases the lesions were invariably widespread and consequently no minute localization was possible. Whipple¹⁵ also reports a similar case. After careful histological study, and assisted by these pathological data, as also by some experimental evidence, Campbell describes three types of temporal cortex: (a) audito-sensory; (b) audito-psychic; (c) common temporal cortex. As is seen by the accompanying tracing the anterior third of the first temporal gyrus is designated under "common temporal cortex"; this being so, we should hardly expect its absence in this case to give much if any sensory disturbance. Turning to the history of our case we find that he had been deaf for four years previous to death; if then we could establish the fact that the cyst and consequently the hypoplasia of the first temporal convolution were congenital, it would be a point against the special auditory function of the anterior third of this gyrus. Suppose, on the other hand, the cyst and consequent atrophy of the first temporal gyrus appeared four years before death, we then may think of the "special function" of this part of the temporal lobe.

A case¹⁶ in some ways resembling this one may here be recorded: A tumor of the dura which "seemed to be sarcomatous," about the size of a hen's egg, was found to have made a deep impression in the right temporal-sphenoidal lobe (i. e., the tumor was of the same size and pressed on the same area as in our case, but on the *right* side). The patient was epileptic for nine years; beyond that no motor or sensory symptoms could be detected.



THE SHADED AREA REPRESENTS THE APPROXIMATE POSITION OF THE CYST.
(Tracing from Cunningham's Anatomy, p. 520.)



LOWER BORDER OF SYLVIVS.

Adapted from Campbell's, p. 158.

- (a) Audito-sensory (densely shaded)—confined to two transverse temporal gyri and not extending onto insula.
- (b) Audito-psychic (large dots)—on free surface of post. 3/5 of T_L .
- (c) Common temporal cortex (small dots).

CONCLUSIONS.

1. A cyst of the dura mater, probably congenital, occupies a considerable part of the left middle cranial fossa.

2. Associated with the dural cyst is distortion of the greater part of the left temporal lobe. There is also considerable loss of substance of the anterior part of the superior temporal convolution, presumably from pressure exerted through intervening tissue.

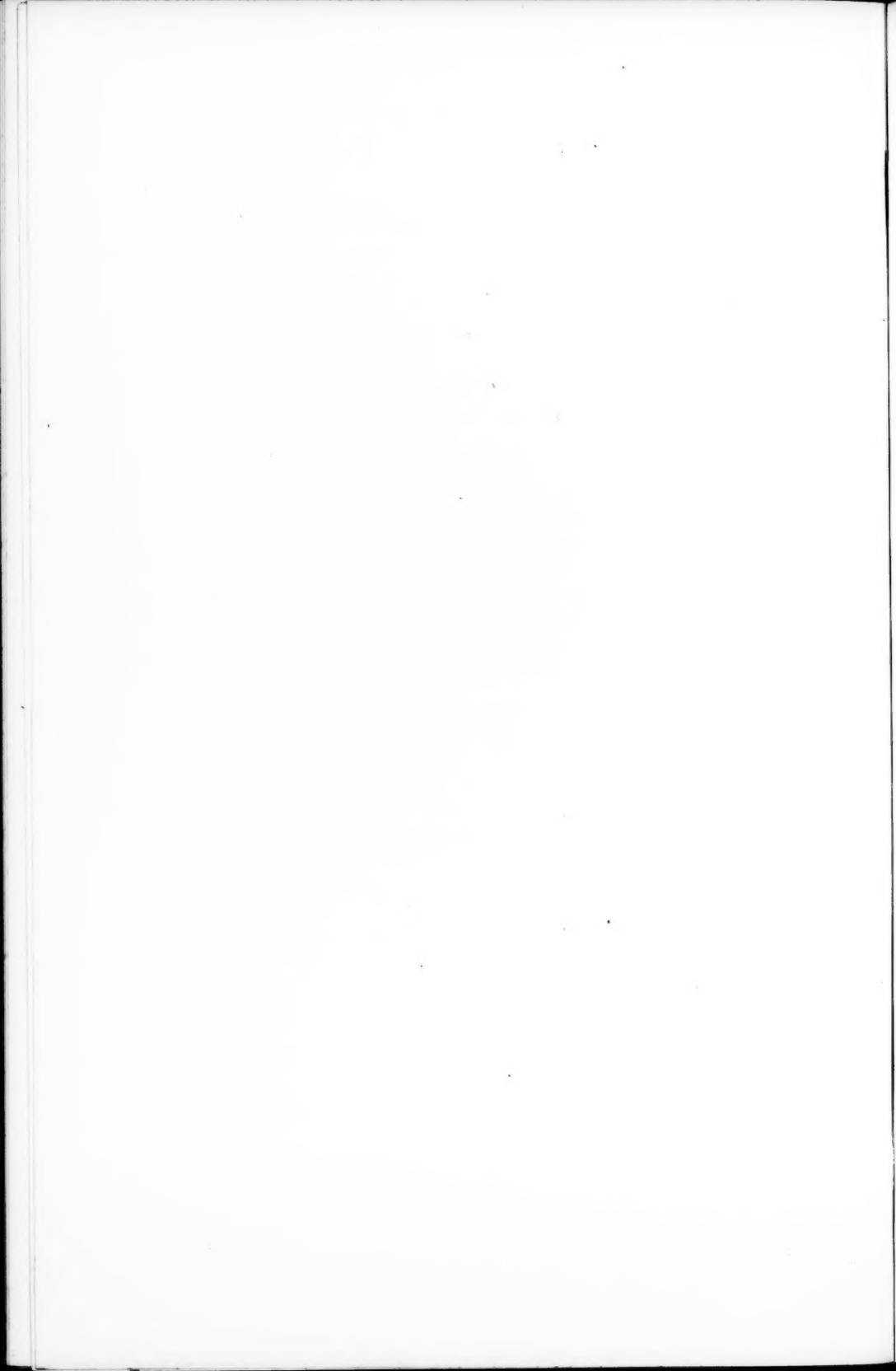
3. Assuming the cyst to be congenital, this condition of the superior temporal convolution may be looked upon as due to hypoplasia.

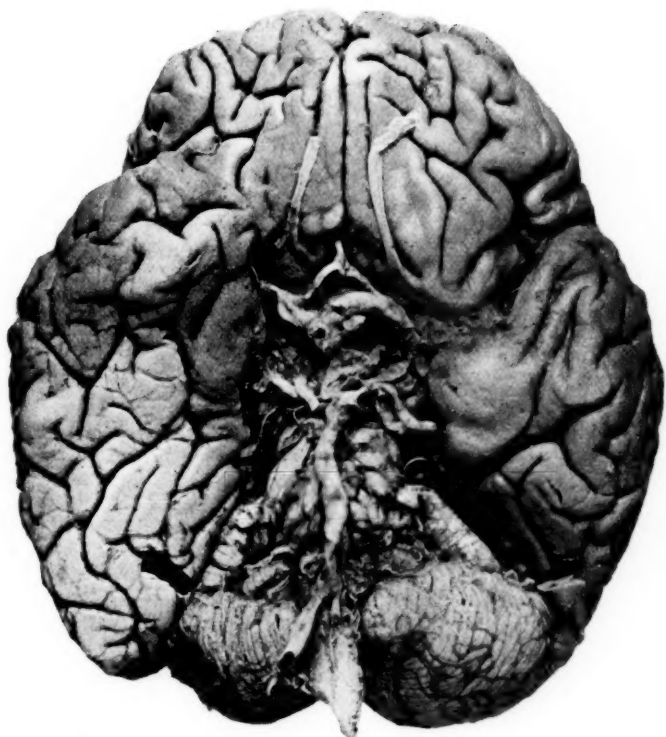
4. The patient's history gave no ground for suspecting a focal lesion involving the left temporal lobe; nor can the peculiar distortion and hypoplasia of the temporal cortex here described reasonably be related with the clinical history of four years' deafness.

NOTE.—The above report is from the Pathological Laboratory of the Danvers (Mass.) Insane Hospital, in connection with a fourth year elective course at the Harvard Medical School, under Dr. E. E. Southard, for whose kindly assistance the author wishes to express his gratitude.

REFERENCES.

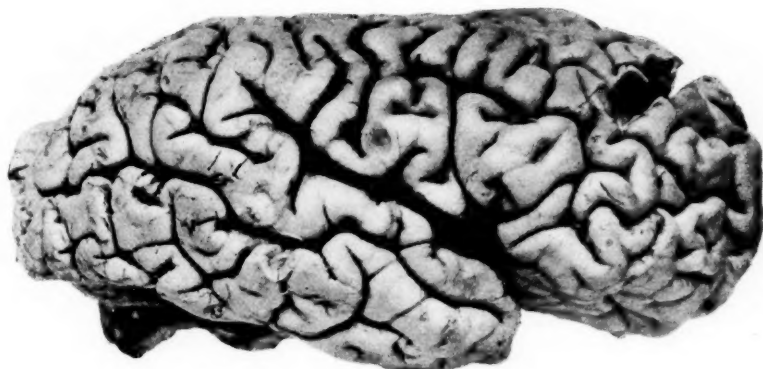
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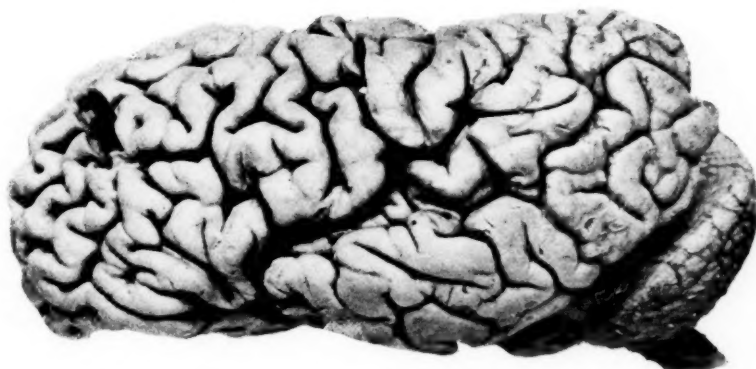


PHOTOGRAPH OF THE FORMALINE-HARDENED BRAIN.

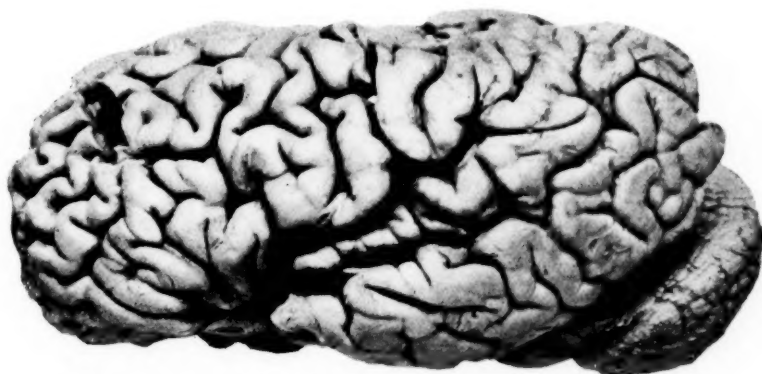
(Cyst occupied a position approximately as shown by diagram in text.)



RIGHT SIDE, TT₁ NORMAL.



LEFT SIDE, TIP OF TT₁ ATTENUATED AND ALMOST HIDDEN FROM SIGHT BY OVERLAPPING GYRI.



LEFT SIDE, TT₁ SEPARATED FROM SURROUNDING CONVOLUTIONS BY ARTIFICIAL MEANS.

SOME ORIGINS IN PSYCHIATRY.¹

By CLARENCE B. FARRAR, M. D.,

Assistant Physician and Director of the Laboratory, Sheppard and Enoch Pratt Hospital; Instructor in Psychiatry, Johns Hopkins Medical School; Visiting Physician, Bay View Asylum.

I.

There are two somewhat contrasting opinions which one often hears expressed concerning the state of current psychiatry, neither of which is distinctly new and neither of which gives an accurate representation of the facts.

The first of these opinions is that mental pathology is in a very backward stage of development as compared with the other branches of medicine, that it has always lagged hopelessly behind, and that only with a sort of apology can it take its place beside its sister sciences. The fallacy here is twofold. It is partly simple error and partly the result of comparing dissimilars. In the middle of the last century, FEUCHTERSLEBEN prefacing his textbook of Medical Psychology, expressed himself with some spirit and very much to the point with regard to this opinion which has been handed on in a stereotyped manner from generation to generation.

It has become the fashion, wrote FEUCHTERSLEBEN, when conversation turns to this subject, or when judgment is to be passed upon a work on psychiatry, to regret with genteel humility that this study has been, unfortunately, all too sadly neglected; that in this sphere, therefore, in comparison with others, we are still groping about too much in the dark, etc.! It has become the fashion to repeat this complaint so often, and yet again, that the fashion—like every other—must cease to be the fashion, for it is out of date and no longer true. Only ignorance of the solid accomplishments in this field which recent years have brought forth, or inability to estimate their worth, can be responsible for the repetition of this complaint. The difficulties which beset the way in the different sciences are various, but in *this one*, relatively as vigorous progress has been made as in others.²

¹ From lectures to the fourth year class, Johns Hopkins Medical School, 1907.

² *Aerztliche Seelenkunde*, p. IX.

And this was written in 1844!

The second opinion is of a different tone, and in giving emphasis to the refinements of modern differentiation, would seem to imply that many, perhaps the greater portion of our clinical types in psychiatry have distinctly the stamp of newness, that we are the proud possessors, as it were, of proof copies of disease. In summing up our twentieth century attainments we feel perchance a patronising satisfaction,

Zu schauen wie vor uns ein weiser Mann gedacht,
Und wie wir's dann zuletzt so herrlich weit gebracht!

In how far this view is correct the following pages will sufficiently demonstrate.

To the two uncritical opinions mentioned, a third and more serious one may be added. The fashion has grown up in our day of discussing as a matter of fact an alleged alarming increase in the number of insane in all civilised countries during later years. The idea, unfortunately, has become popular, and is passed from mouth to mouth without the possibility of its verification being questioned. People note with a sad shake of the head the increasing number of hospitals for the insane, and ask each other, "What are we coming to at the present rate?" But, like Pilate in his inquiry about Truth, they do not stay for a reasonable answer.

The fact is that those who declare that insanity is on the up grade are reckoning with only a part of the figures, and that the circumstances which should be looked upon with gratification, namely that the number of cases *recognised and treated* is increasing, is misinterpreted as indicating an actual extension of the ravages of the disease. In every country there seems to be a fairly constant proportion of mentally defective and diseased in the population, (making allowance for certain biologic ebbs and flows to be mentioned later). This proportion has never been accurately determined, and in the past only a relatively small number of the insane received treatment. What statistics show is that the number of patients *admitted to hospitals* has been growing with succeeding years, both actually and in proportion to the increase in population, but certainly at the progressive expense of

the indeterminate mass of hitherto unrecognised or unrecorded cases. And this is precisely the thing that has been desired. Under present conditions the hospitals are the best places in the majority of instances for the treatment of mental disease, and it has been a bitter struggle to overcome popular prejudice against them. The statistics indicate that this end is gradually being accomplished. They show further that in many cases which doubtless formerly would have escaped notice, diagnoses are now made; and what is infinitely more important not only for the good of the patient, but of the community as well, they show that diagnoses are made and treatment instituted much earlier in the disease than was previously the rule. In years gone by it was common enough for patients to be brought first to the hospital months or even years after conspicuous signs of mental disturbance had appeared, and when the possibilities of benefit by treatment had grown small indeed, the step being taken perhaps because the patient had become quite unmanageable at home or the relatives were weary of the burden. Now, on the contrary, cases are more and more often being received during the initial phase of their illness, and not infrequently within a day or two of the appearance of symptoms.

All these are welcome facts. What the statistics do not show, and probably never will show, beyond peradventure, is that the sum total of insanity *in the community*, both in and out of hospitals, is progressively increasing. In all the fields of inquiry nowhere are complete and accurate figures more difficult, more nearly impossible to obtain than in this one, but in the absence of such figures, we have no more right to beg the question one way than the other.

Beside the reasons already mentioned for the *apparent* increase, as revealed by statistical tables, must be remembered the fact of the so-called "accumulation" of patients in hospitals. It is one of the accomplishments of modern equipment and methods of care-taking that in many forms of incurable mental disease the death rate has been steadily reduced, with a corresponding advance of longevity and an increase from decade to decade in the number of the aged insane. Whether or not these circumstances in themselves are blessings is not to be argued here, but their existence

must be borne in mind as contributing factors to the lamented statistical increase of insanity.

It is significant to note that in Scotland where the attempt is made to take official account of the entire number of insane in the population, the figures show "a retardation of the increase of insanity in proportion to population during the last three years. During the past year (1906) no increase of the insane occurred in proportion to population."³ Thus in Scotland, the only country where statistics even approaching completeness are available, there is an admitted standstill in the previous apparent relative increase in the number of insane in the community.

There are many more reasons, remarks MACPHERSON,⁴ for believing that the variation of mental unsoundness is a fixed and constant one from year to year than for believing that insanity is increasing . . . the theory of the absolute increase of insanity is founded on assertion, with nothing whatever to support it.

HUMPHREYS, in an authoritative investigation of conditions in England and Wales, comes to similar conclusions. He expresses the "decided opinion that there is no absolute proof of actual increase of occurring insanity in England and Wales," and that the "increase of the registered and certified insane is not really the result of increased prevalence of insanity."⁵

These views were also supported by MACDONALD⁶ in his Presidential Address before the Medico-Psychological Association of Great Britain and Ireland last year.

In Germany we find the same view-point expressed in recent literature. E. MEYER,⁷ speaking of the increasing admissions to hospitals, points out that this circumstance by no means indicates a total increase of insanity, and that in spite of a popular feeling of a progressive spread of mental unsoundness, there are no figures to justify such an assumption. HACKL and GRUNAU (cited

³ Forty-eighth Annual Report of the General Board of Commissioners in Lunacy for Scotland, 1906.

⁴ Morison Lectures, V, *Journal of Mental Science*, July, 1905.

⁵ "The Alleged Increase of Insanity." *Journal of the Royal Statistical Society*, June 29, 1907.

⁶ *Journal of Mental Science*, October, 1907.

⁷ *Die Ursachen der Geisteskrankheiten*, Jena, 1907.

by MEYER) further emphasise the failure of statistics to prove an actual increase of insanity within recent decades.

In our own country statistical returns are notoriously inadequate. It is admitted by the Census Bureau that enumerations previous to 1880 are "entirely worthless so far as the calculation of ratios of number of insane to population is concerned."^{*} In the three censuses since taken the methods and scope of inquiry have each time been so radically altered that their results are utterly incomparable.

It need hardly be suggested that the cumulative effect upon the popular mind of the alarmist outcry that insanity is constantly laying a heavier toll upon the nation, must be anything but salutary, and it is high time that a halt be made in its spreading currency.

While we have not, therefore, the figures to warrant our assuming a positive increment of mental unsoundness in successive decades or generations, we are nevertheless bound to recognise considerable variations in the prevalence of insanity, on comparing widely separated epochs in the history of human development. There is every reason to believe that in the infancy of the race, as in the infancy of the individual, and as among primitive peoples of the present so long as unmixed with foreign elements, cases of alienation were comparatively rare; and it is just as patent that the so-called higher states of civilisation, with their increased complexity and refinement of both social and personal organisation, and with their accompanying exaggerated possibilities of harmful indulgence, are directly associated with a plus of nervous instability and actual disease. We lay many ills to the charge of what we are pleased to call the stress of civilisation, or the high tension of modern life, and this is not altogether fair. There never was a time when life was not a struggle and stress is the medium of growth. It is only when the pressure of activity becomes one-sided and is associated with an imperfect or incomplete development and symmetry of the whole individual or with disharmonies in his varied natural functions, that we may look for disaster.

In general terms it may be set down that insanity, together with

^{*} Report on the Insane, etc., Eleventh Census, 1890.

other possibilities for evil, increases in a given race in proportion to its progressive biologic differentiation; but the assumption that the process is steadily in one direction, presaging an advancing degeneracy of the human species, would be as ill-founded as would be the assertion that the process of civilisation is a teleologic one, the result of purposeful design and with constant upward tendencies—an assertion to which the records of antiquity would at once give the lie.

The proportion of mental aberration throughout the history of the rise and fall of nations may be represented, therefore, not by a steady upward curve, but by a wave-like one, in which the valleys stand for the formative and early periods of development, times in which the burden of stress is likely to be physical, while the high points of the curve represent in succeeding peoples the climax-periods of organisation and specialisation, during which the burden of stress may be assumed to be psychic.

In a casual comparison of our own time with other historic epochs we are struck by contrasting elements of gain and loss which must be set down in the account of our own mental health; and apart from the tendency to psychopathic degeneration in the individual as influenced by refinements of organisation, we note that the psychic integrity of a people in the broad sense is reflexly determined by the dissemination of certain controlling ideas which gradually become principles of national thought and action, and which slowly succeed each other in an unending series of harmonies and discords.

The ideas of the utility of the individual which prevailed in the states of Greece and Rome during their prime were directly effectual in cutting down the number of abnormal and undesirable members of the community, in materially reducing for a time the burden of morbid heredity, and in fostering a regime of national health and culture, before which the later world bows in respect and admiration. The Spartans exposed on the hilltops their imperfect progeny, while the Romans cast down theirs from the Tarpeian Rock, thus weeding out of society many congenitally defective and degenerate individuals that to-day are scrupulously saved and nursed through perhaps a long life of utter uselessness, an objectless burden to the State.

If our modern civilisation is at a disadvantage in certain particulars by comparison with the past, there are others to be reckoned as compensation. There is, for example, one particular form of nervous disorder, or we should better say a large group of disorders, which were the scourge and disgrace of the fifteenth, sixteenth, seventeenth, and eighteenth centuries, but which are no longer a menace to society at large and have only occasionally to be reckoned with in circumscribed districts. I mean the terrible psychogenic epidemics, the stigmata of the Middle Ages, which were the first-fruits of that black fear—the spawn of ignorance and religious superstition which the so-called Christian church cast like a pestilential pall over all Europe. This sort of contagion is not possible to-day. To be sure, the fear of witches, ghosts, and spells is not yet dead among the lower elements of society, and we see, moreover, now and then, some tempest-in-a-teacup demonstration by a group of fanatics who assume to have discovered the true religion; some self-elected prophet with a band of frail followers announces the day of judgment to be at hand; a group of impulsive, over-wrought individuals see visions or speak with tongues, under the influence of an evangelistic prodigy; a Dowie comes perchance to regenerate New York: but the minds of the people at large are not infected. The world glances up amusedly and moves on; but as soon as fanaticism transgresses the law of the land it pays the penalty, and the social body maintains its mental health.

That insanity, crime, and vice should ever overspread and possess the world would be as preposterous, although no more preposterous an assumption, than that these elements might one day by the favor of Providence be quite eliminated from our human tissue. Like the poor we have them always with us, and in this present tense we must include the entire past history of the species together with all its possible future. The germs of alienation, like other and definitely structural defects, are co-existent with life, and this element of morbid potential to which the name "Psychotic Moment" has been given, is present not only in all peoples and all times, but extends to include other animals than man, as comparative psychology abundantly proves.

* FUHRMANN, *Das psychotische Moment*, Leipzig, 1903.

To sum up, there are three conditions under which the *psychotic moment* increases in intensity. First, with the successive steps in biologic differentiation (phylogenesis) reaching its maximum potential in the refined organisation of human intelligence; second, with the progressive development of individual races, finally reaching its acme during the highest phase of civilisation; third, in the successive periods in the life of the individual, the analogy between ontogenetic and phylogenetic growth holding good in that during the early childhood of the individual, just as in the childhood of the race, the appearance of insanity except under the forms of congenital defect, is rare.

II.

It is our object now to pick out from the records of the past certain elemental viewpoints concerning disease of the mind, which have obtained in succeeding epochs, some of which have been long superseded and forgotten, some of which we hold to-day, perhaps unconscious of their antiquity. In making such an excursion we shall at one turn be shocked by the horrors or absurdities which meet our gaze, at the next we shall be filled with admiration for the wisdom and humanity of individual men, often far in advance of their age, who have instituted reforms in the manner of conceiving insanity and treating it, than which no greater or more memorable have been made in any department of science.

The history of insanity may be considered under four great periods. First, the primitive period proper, which extends backward over unnumbered centuries into the mythologic past and ends with the sixth century B. C. During this early period priestcraft enjoyed full authority and mental disturbances like other manifestations of disease were ascribed unquestioningly to supernatural influences.

The second period was born with the establishment of the Pythagorean school and the development during the following century of that of the Asclepiades and their most illustrious representative HIPPOCRATES. During this Golden Age of science the priest was cast down from the high places of authority in

medicine and men formed the habit of observing, inquiring, and proving, where previously they had only believed.

The Hippocratic era endured hardly 700 years and expired with GALEN in the second century A. D. Hereupon followed an age of darkness 1500 years long, a period longer by 300 years than that of the Middle Ages as commonly set down, and during which the priesthood and the church returned triumphant to their own, quenched in every way possible the light of reason in a night of superstition and fear, and re-established with magnified horror the demonology of aboriginal man.

We have thus a striking recurrence of two alternating and mutually exclusive periods. The Middle Ages represented the primitive period of antiquity, while the modern era dating from the seventeenth century, represents a revival of the Golden Age of Hippocrates.

It is a notorious fact that religious manifestations and mental aberration have ever stood in close relationship to each other. Therefore, in seeking to understand the attitude of primitive man toward the occasional cases of mental disease which it would be his lot to observe, it will be necessary to take into account the manner of origin of the idea of supernatural beings—gods and devils, among early mankind.

The human mind is prone, in the presence of the unknown, to seek short cuts. Surrounded by the elements and forces of nature which he could neither comprehend nor control, they became for prehistoric man awe-inspiring mysteries; and when it was brought home to him that they were capable of doing him harm, even of taking his life, they became for uncritical man superior animate beings whom he endowed with qualities like his own, whose favor was to be courted and whose wrath appeased. Thus did man create God in his own image.

Naturally every manifestation of energy not the immediate fruit of his own toil was ascribed by primitive man to supernatural agencies, and when, perchance, his own labors miscarried, this must needs likewise be due to their interference. The mysteries of birth and death and sudden illness and all unusual or unexpected occurrences were straightway assumed to have some special divine significance. So it came about that a person men-

tally disturbed was looked upon as being under the particular influence of some Deity, and such a state was at first considered blessed; and the unfortunate sufferers from fits, hysteric seizures, and other nervous disorders were believed to be enjoying the visitations of the Almighty and were often venerated as saints.

Just here we must take into consideration a second phase in the development of the idea of supernatural beings. It is well known that, as far back as human records extend, each tribe and each nation have established their own private set of gods, which partook of their own character and were the embodiment of their own peculiar form of life, under whose exclusive protection they believed themselves to live; and who stood ready to smite their enemies or to deliver their weaker neighbors into their hands, if for no other reason than that they coveted their lands, their wives, or their treasure. This state of society is constantly presented in the stories of the Old Testament. Thus the gods of the Egyptians and Assyrians and Babylonians became for the ancient Hebrews an abomination whose influences were not for good, but unmitigatedly evil.

Whether a supernatural being was a god or a devil became merely a question of view-point. The gods of subjugated races became devils in the theologic system of the conquerors, and the Good Spirits of one nation were the Evil Spirits of their neighbors, and vice versa. Among the early Hindoos, for example, the Devas were the spiritual incarnation of good, so to speak, while the Asuras were the embodiment of evil. Among the Persians, however, this order was reversed, and the Asuras were worshipped as gods and the Devas feared as devils. Moreover, as is well known, the Dämon of the Greeks was a guardian angel, while in the Middle Ages Dämonology refers exclusively to the works of the Devil.

In accordance with this remarkable metamorphosis in belief it is clear that the status of the insane among primitive peoples and in naïve minds in all ages has undergone startling changes. The epileptic or the maniac of early antiquity who was the object of divine influence, became during the later centuries of the Dark Ages the prey of diabolical agencies. He was no longer the inspired of God, but rather the possessed of the Devil, and the church meted out to him heroic treatment accordingly.

Inasmuch, however, as the Old Testament scripture teaches that the Devil, after all, is allowed to exercise his malevolent functions only by the suffrage of Jehovah—and, indeed, we recollect one test-case in which he was expressly commissioned by the Almighty to visit one of the saints with all manner of pestilence, in order to try his integrity—it is easy to see how mental derangement came also to be looked upon as a form of divine punishment or vengeance. This doctrine is first clearly enunciated in the curse of Moses upon the Israelites, in which for failure to follow the statutes, he promises in a long array of horrors, that “The Lord shall smite thee with madness, and blindness, and astonishment of heart.”¹⁰

In the earliest recorded case of lunacy, that of Saul (1097-1058 B. C.), king of Israel, similar views are expressed. According to the story, Saul failed in carrying out to the letter, a divine injunction to slay every living thing of a neighboring tribe, whereupon “the spirit of the Lord departed from Saul, and an evil spirit from the Lord troubled him.” The madness of the king, ending in death by suicide, is frequently referred to from the sixteenth to the thirty-first chapters of I Samuel. It seems to have been a recurrent case, with contrasting phases—at one time depression, suspiciousness, indecision, even mutism; at another, excitement, ecstatic logorrhœa (prophesying), violent and impulsive anger, and homicidal tendencies. That the incoherent utterances of the madman were regarded as prophetic is distinctly stated,—“the evil spirit from God came upon Saul, and he prophesied in the midst of the house.” The declaration repeatedly recurs that Saul’s infirmity was due to an “evil spirit from God.” How the theologic exegetists explain away the apparent contradiction of those words, would be an interesting speculation.

It is an important therapeutic observation in connection with this case, that the evil spirit was often dislodged by the music of David’s harp. But when the king was in a phase of violence and anger, this form of exorcism was not always efficacious, and on two occasions the harpist narrowly escaped being transfixed by his master’s javelin. Nevertheless, since the days of David, music has often figured in the treatment of mental disease.

¹⁰ Deuteronomy XXVIII, 28.

The story of Saul may be taken as typifying the opinion concerning insanity which prevailed throughout the early period of antiquity. The records of Egypt, Persia, Assyria, and Greece, all supply evidence of the same sort. The only etiology was supernatural, the entrance into the sufferer's body of a spirit, good or bad, which thereupon controlled his words and actions. The symptomatology and course of the disease were therefore as obscure as the ways of Providence are inscrutable, and the sole therapy was magic, incantations, prayers, and sacrifices, or exorcisms, often of the most violent sort. Insanity being thus a manifestation of demoniac power, to study it was out of the question, the self-styled "scientific theology" of our day not having yet been invented.

The salient facts are that insanity as a disease was practically unknown; that the first attempt to control the condition was by means in which we recognise the prototype of our modern psychotherapy; that this primitive psychotherapy lay exclusively in the hands of the priests, the science of medicine not having yet been divorced from theology. It is a curious phenomenon that 2500 years after the latter event had taken place, men still are found who strive to annul this ancient decree, and by such methods as the recent campaign of WORCESTER, of Boston, carried even within the walls of this hospital,¹¹ and later, by his imitator FALLOWS, in Chicago, to set up again the priestly authority in medicine, as it was before the emancipation days of PYTHAGORAS and HIPPOCRATES.

One of the most direct and startling results of the belief in a supernatural origin of mental disorder was the facility of mental contagion, which is largely the product of fear and self-insufficiency. Accordingly, even in the early period under consideration, we find evidences of mental disease suggested from one to another in a manner similar to that which in mediæval times resulted in the Crusades, and the unnumbered hysteriform endemics and panics which overspread Europe.

In the account of King Saul, we read that when in his anger he sent messengers to take David to put him to death, fear fell upon the messengers as they approached to do the King's bid-

¹¹ The Johns Hopkins Hospital.

ding. In the scriptural text, the expression "Spirit of God" appears to be equivalent to the more intelligible phrase, "superstitious fear."

And when they saw the company of the prophets prophesying, and Samuel standing as appointed, over them, the Spirit of God was upon the messengers of Saul, and they also prophesied. And when it was told Saul, he sent other messengers and they prophesied likewise. And Saul sent messengers again the third time, and they prophesied also.

Finally, in desperation, the King set out himself to apprehend David, but

the Spirit of God was upon him also, and he went on, and prophesied, until he came to Naioth in Ramah. And he stripped off his clothes also, and prophesied before Samuel in like manner, and lay down naked all that day and all that night. Wherefore they say, "Is Saul also among the prophets?"¹²

Parts of this description might apply, with local variations, to some of our twentieth century revivals. The manner of mental contagion is clearly indicated, as well as the character, in this instance at least, of prophet and prophecy. Saul, so far as we know, prophesied only during his fits of maniacal rage.

In the days of Nebuchadnezzar (601-561 B. C.) whose reign stands as the most glorious in the history of the Babylonian Empire, the spirit of mystery and superstitious suggestibility was still rampant, as witness the direful consequences of the king's dream, and a little later of the slate-writing of Belshazzar. Many another besides Nebuchadnezzar has been terrified by an ominous dream in the initial period of a depressive psychosis, but the method of Daniel in substantiating the fears of the king, and declaring by a forced interpretation the immanence of his madness, is not now considered good prophylaxis.¹³

Among the diseases of antiquity there was one, epilepsy, which by reason of the spectacular manner of its operation, was peculiarly calculated to support the prevalent belief in the supernatural source of mental affections. *Morbus Herculeus* was an early name bestowed upon the malady because of its illustrious victim, the demi-god Hercules. Juno, who had no love for the natural

¹² I Samuel, XIX, 20-24.

¹³ Daniel IV.

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" Daniel IV.

children of Jupiter, of whom Hercules was one, sent his infirmity upon him by the hand of Lyssa, the daughter of Night and the personification of madness. In his tragedy, "The Phrenzy of Hercules," Euripides gives a vivid picture of the sudden violent seizures to which the hero was subject from his youth. Coming without warning, perhaps in the midst of some active exploit, or again following over-exposure to the sun's heat, these seizures were accompanied by rolling of the eyes, foaming at the lips, clouding of consciousness, and wild impulsive fury, which usually meant death to whatever creature might be near. In one of his attacks, Hercules' own wife and children fell under his hand. The crisis was reached when the victim fell writhing on the ground, struck in the breast, according to the poetical narrative, by a rock hurled by Pallas who appeared just too late on the scene. Hereupon he is bound with strong cords to prevent further danger and sinks into profound sleep. On awakening, there is the characteristic amnesia for the acts of violence which initiated the attack, and the hero is filled with astonishment and chagrin when acquainted with the effects of his fury.

On account of its assumed divine origin, epilepsy came to be known as the "Sacred Disease," (*Morbus sacer*) and under this name it is described by HIPPOCRATES.

III.

But HIPPOCRATES (460-377 B. C.), to whose age we must now turn, overstepped the previously current notions of disease. In his concise language we see for the first time clearly suggested the great *lex parsimoniæ* which is the *sine qua non* of all true scientific inquiry. "It is thus with regard to the disease called Sacred: it appears to me to be nowise more divine nor more sacred than other diseases, but has a natural cause from which it originates like other affections. Men regard its nature and cause as divine from ignorance and wonder, because it is not at all like to other diseases. . . . But if it is reckoned divine because it is wonderful, instead of one there are many diseases which would be sacred. . . . The quotidian, tertian, and quartan fevers seem to me no less sacred and divine in their origin than this disease, although they are not reckoned so wonderful . . . there is no

necessity for making a distinction, and holding this disease to be more divine than the others, but all are divine, and all human."

With the progress of Greek culture, the new era began really a century before the birth of HIPPOCRATES, and may be dated from the work of PYTHAGORAS (582-504 B. C.), the philosopher-physician of Samos. PYTHAGORAS was well acquainted with the philosophy and priestly therapeutics of ancient Egypt and had traveled extensively through the then civilised world, and he it was who first let the light of practical truth into the hollow mysteries of the temple. The principle of the Pythagorean school was less to cure disease than to remain healthy, and to that end was drawn up a careful programme for the daily life, which is not falsely named, "The Diet of the Soul." Let me give in condensed form the day's programme of the disciples of Pythagoras.

The day began with a quiet walk in some secluded place, a grove or temple, not only to refresh the body and the senses, but also to compose the spirit in anticipation of the business of the day. This morning stroll was accompanied by the music of the lyre in order to dissipate the last remaining mists of sleep, and tune the soul to harmonious activity. It was deemed unwise to plunge at once into commerce with others before taking time to hold communion with oneself. The early walk ended, the Pythagoreans met together in temple, or other congenial place, where they devoted their freshest energies and the best hours of the day to the gentle occupation of teaching or learning. Whereupon succeeded games, dances, and athletic contests to lend strength and suppleness to the body. Then came the frugal mid-day meal, after which we may guess the modern continental breakfast was planned. It consisted simply of bread and honey taken not to satisfaction, but only in quantities sufficient to still the pangs of appetite. Neither wine nor meat was tasted. The afternoon was devoted to various public engagements and affairs, and the day closed as it had begun, with a leisurely walk, though not solitary as in the morning, but in twos and threes; and this evening walk was the occasion for reviewing and discussing the subjects of the morning's study or observation. After the walk, a cold bath,

"*The Sacred Disease*. The genuine Works of Hippocrates. Sydenham Society Publications.

then dinner, which, although always finished before sundown, was of a more generous and festive character than the luncheon at mid-day. Meat and wine were, however, taken only in small quantities. Dinner was the social occasion of the day. Small groups of congenial spirits met together at table, and the evening passed in conversation and reading, one of the party usually reading aloud. On leave taking they recalled to each other the essential principles and obligations of their common manner of life, and finally, when once more alone, each one passed in mental review, the matters of the day, assorting, collecting, unifying, taking really an inventory of mental and spiritual stock at the end of every twenty-four hours; which done, they were ushered by the gentlest harmonies of the lyre into a refreshing and dreamless sleep."

From this somewhat austere but pre-eminently salutary regimen, there resulted the *mens sana in corpore sano* for which the Pythagorean school is renowned. Music, which held so important a place in the daily programme, was also brought into service in treating affective forms of insanity.

It was the service of the Grecian school that they brought the etiology of disease from the skies to earth, and thus made its study and rational treatment possible; but the master-stroke lay in including mental affections with the other diseases of mankind, in denying their ultimate mystery and their assumed divine significance.

"I am of opinion," wrote HIPPOCRATES, "that the brain exercises the greatest power in the man. This is the interpreter to us of those things which emanate from the air, when it happens to be in a sound state. But the air supplies sense to it. And the eyes, the ears, the tongue, and the feet administer such things as the brain cogitates. . . . And by the same organ we become mad and delirious, and fears and terrors assail us, some by night and some by day, and dreams and untimely wanderings, and cares that are not suitable, and ignorance of present circumstances, desuetude and unskilfulness. All these things we endure from the brain when it is not healthy, but is more hot, more cold, more

"From Meiner's description (*Geschichte der Wissenschaft in Griechenland und Rom*); *Vide* Feuchtersleben, *op. cit.*, p. 31.

moist, or more dry than natural, or when it suffers from any other preternatural or unusual affection." ¹⁴

The doctrine that madness is the expression of disease of the brain strikes true to-day; but the Hippocratic humoral pathology was abandoned with the Renaissance. According to this theory, man was a miniature embodiment of the universe, the four elements of the latter—earth, water, fire, and air—being represented by the four humours, yellow bile, black bile, blood, and mucus, respectively, and these four humours contributing to the body the respective qualities of dryness, moisture, heat, and cold. The various manifestations of insanity were merely the effects, therefore, of an excess of one or the other of these elements, the expression of too much heat or cold, or of too much or too little moisture in the brain.

Our word "melancholia," a term now without a meaning etymologically, is the last surviving witness of this ancient doctrine.

Looking as he did upon all diseases as the result of definite organic derangement, it was natural that HIPPOCRATES should give particular attention to the accompanying mental symptoms in the various somatic diseases, such as the delirium or transitory psychoses associated with febrile states, which, however, he did not sufficiently distinguish clinically from the so-called afebrile psychoses. It is easy to understand that the psychiatry of HIPPOCRATES should have been purely symptomatic, that is, that an undue importance should have been attached to isolated but conspicuous phenomena in a given disease-picture; in other words, that the disease should have been described in terms of its cross-section. Such a result was inevitable in the infancy of the science. The clinical method of diagnosis in the modern sense, which requires the careful observation of cases throughout the entire course of the disease, often a period of many years, and which in turn, necessitates hospitals devoted to the segregation of mental cases—in other words the study of the longitudinal section of insanity, was obviously impossible in the early days of Greek and Roman medicine.

We nevertheless owe to the Hippocratic school the distinction and naming of two diseases, *mania* and *melancholia*, the former a state of excitement and violence, the latter a condition of anx-

¹⁴ Loco citato.

xiety, fear and seclusiveness; and these two diseases, together with *dementia*, also a Hippocratic derivative, have constituted the groundwork of psychiatry for 2500 years. Inasmuch, however, as the symptoms of affect depression and exaltation have in themselves no particular pathognomonic significance, and inasmuch, further, as patients assumed to be in an advanced state of mental deterioration have sometimes made the most surprising recoveries, to the discomfiture of the alienist who had given an unqualifiedly bad prognosis, it is self-evident that the early symptomatic descriptions would not always be as clear and convincing as might be desired, at least in so far as the delimitation of individual disease types was concerned.

A form of insanity which is very popular just now, the *maniacodepressive-psychosis*, we are inclined to look upon as peculiarly the property of our own century. It represents the fusion of the ancient types, mania, and melancholia, as set forth by FALRET, BAILLARGER, and later by KRAEPELIN. And yet the possibility of this intimate relationship between two morbid states, on the surface so opposite, was clearly suggested by ARETAEUS, of Cappadocia, who lived toward the close of the Hippocratic epoch.

ARETAEUS (80 A. D.) excelled his predecessors in his brief and lucid characterisations of various types of alienation, and he contributed not a little to existing knowledge regarding symptomatology, differential diagnosis, and therapy. He dwelt at some length upon the nature and consequences of *apoplexy*, detailed the symptoms and the mental state of the *epileptic*, and various manifestations of *hysteria*, which he attributed altogether to vagaries of the uterus. We may take ARETAEUS' account of the causation of "hysterical suffocation" as typifying prevalent concepts of pathogenesis.

"In the middle of the flanks of women lies the womb, a female viscus, closely resembling an animal; for it is moved of itself hither and thither in the flanks, also upwards in a direct line to below the cartilage of the thorax, and also obliquely to the right or to the left, either to the liver or spleen; and it likewise is subject to prolapsus downwards, and, in a word, it is altogether erratic. It delights, also, in fragrant smells, and advances towards

them; and it has an aversion to fetid smells and flees from them; and, on the whole, the womb is like an animal within an animal.

When, therefore, it is suddenly carried upwards, and remains above for a considerable time, and violently compresses the intestines, the woman experiences a choking, after the form of epilepsy, but without convulsions. For the liver, diaphragm, lungs, and heart, are quickly squeezed within a narrow space; and, therefore, loss of breathing and of speech seems to be present. And, moreover, the carotids are compressed from sympathy with the heart, and hence there is heaviness of head, loss of sensibility, and deep sleep."¹⁷

But it is principally the ideas expressed by ARETAEUS concerning the primary affect states which interest us here. He adhered to the current symptomatic distinction between mania and melancholia, but his definitions are more precise, and he added new elements to them. Of melancholia he says, "It is a lowness of spirits from a fixed and single phantasy, without fever; and it appears to me that melancholy is the commencement and a part of mania. For in those who are mad, the understanding is turned sometimes to anger and sometimes to joy, but in the melancholics to sorrow and despondency only."¹⁸

In these few words is embodied a viewpoint which has been of great influence upon subsequent observers. Mania is conceived as the severer affection, representing the acme of the pathologic process and involving all the intellectual faculties—a so-called general or universal delirium; while melancholia is of more restricted operation—a partial delirium. This distinction is appreciable when we compare the roaming ideation of the maniac with the introspective brooding of the melancholiac, so well characterised by ARETAEUS—"their depression of spirits is fixed and inherent in a single phantasy." (*Animi angor in una cogitatione defixus atque inhaerens.*) Herefrom arose the conception of melancholia as the insanity of fixed ideas, a view exploited further by later writers.

Not only did ARETAEUS see a close relationship between states

¹⁷ "On the Causes and Symptoms of Acute Diseases," Book II, chap. XI.

¹⁸ *Loco citato*, Book I, chap. V.

of exaltation and depression, but he actually described the transition from a condition of anguish, fear, suspiciousness, and self-centered seclusiveness, to one of euphoria and excessive merriment, culminating even in maniacal fury. This early appreciation we must bear in mind in the later consideration of the modern period.

That the question of differential diagnosis was not neglected, the following bears witness:

The modes of mania are infinite in species, but one alone in genus. It consists in a continued disorder of the mind, without fever; for if accompanied by fever, it is to be known by some other name and is due to other causes. Wine may disturb the reason and inflame to delirium, and certain other substances may produce the same effect; but these affections are not mania, for springing from a temporary cause, they quickly subside, but madness has something confirmed in it. To this mania there is also no resemblance in the mental wanderings which are the calamity of advanced age; for this is a torpor of the senses and a stupefaction of the intellectual faculties. Moreover the delirium of old age never intermits and cannot be cured, while mania, on the contrary, is intermittent, and with care may disappear altogether.

The recurrent character of melancholia also finds mention.

It cannot be doubted that by these means (chiefly evacuates) the disease has either been entirely removed or had intervals of several years. For generally melancholy is again engendered.

In mild maniacal excitement, the sharpened senses, the trenchant wit, the phenomenal memory, the unexpected mental qualities which suddenly develop,—“untaught astronomy, spontaneous philosophy, poetry truly from the muses”—all are duly recorded by ARETAEUS.

Moreover, the primary affect states he distinguished, chiefly by the absence of fallacious sensory perceptions, from *phrenitis* (febrile and delirious conditions). In patients with the latter affection, “the senses are perverted, so that they see things not present, as if they were present, and objects which do not appear to others, manifest themselves to them; whereas persons who are mad see only as others see, but do not form a correct judgment on what they have seen.”

Finally it was noted by ARETAEUS that cases beginning as melancholia not infrequently ended in complete mental reduction.

”L. c., Bk. I, ch. VI.

To quote again, "It is not rare that one sees the sensibility and intelligence of these patients sink into such a state of degradation, that, forgetful even of themselves in their complete fatuousness, they pass the remainder of their lives like brutish beasts." Is it not possible that included in this account are cases of our cherished modern disease, *dementia præcox*? It seems most likely; and if so, then are the two most conspicuous disease-concepts in current classifications, maniac-depressive insanity and *dementia præcox*, the offspring not of the nineteenth, but of the first century, A. D.

In May, 1849, Dr. LUTHER V. BELL, physician-in-chief to McClean Hospital, read a paper, "On a Form of Disease resembling some advanced Stages of Mania and Fever."²⁰ Two years later, WILLIAMS,²¹ assuming a specific etiology, suggested the name *typhomania* for this condition. The description of BELL being the first of modern authors, the disease is in this country rightly known by his name. In Europe, however, it is usually referred to as *delirium acutum*, following a later account of CALMEIL.²² This disorder, as we have seen, was well known to the Grecian school under the name *phrenitis*, and was sufficiently characterised by SORANUS, a contemporary of ARETAEUS, and one of the most illustrious representatives of the school of "methodists" founded by ASCLEPIADES.

In *phrenitis*, said SORANUS, writing about the close of the first century, A. D., there is always fever. The patient laughs quietly or in sudden bursts, sings, mumbles, utters cries like a child, or speaks only in whispers; or with increased and continued excitement, the patient is restrained with difficulty, irritably resists every attention, beats himself, rends his garments, or perchance tries to hide himself on account of fright, weeping, making no reply to those who address him, but holding conversation with imaginary beings as if they were visible, often indeed with persons who are dead. He falls upon his food and drink and devours it precipitately, or rejects his nourishment after having held it for some time in his mouth. The eyes are widely opened, brilliant, staring; the lids may long remain motionless, or be constantly fluttering. Frequently the patient advances his hand in front of his eyes as if to seize or brush aside some object floating before him. The cheeks are sometimes flushed, sometimes pale;

²⁰ American Journal of Insanity, October, 1849.

²¹ American Journal of Insanity, October, 1851.

²² *Maladies inflammatoires*, Paris, 1859.

occasionally blood issues from the nose; there may be grinding of the teeth. The patient may suddenly give attention as if to some engaging sound; he is utterly regardless of decency, and exposes himself indifferently. The neck may appear swollen, the hands become tremulous, the pulse grows rapid, faint, and irregular, wavering like a lamp which is gradually using up its oil. Diarrhœa supervenes; the patient hiccoughs; the tongue is no longer under control; articulation becomes unintelligible; and eventually convulsions or coma closes the scene.

Significant also are the differential points which SORANUS pushes to some length in distinguishing phrenitis from other mental affections.

The absence of fever (in the latter) constitutes the essential difference. It must be admitted, however, that fever sometimes occurs in mania, so that this distinction may not always hold. But in phrenitis, fever precedes the delirium, while in other conditions the disorder of the intellectual faculties precedes the fever. As it may not always be possible to determine this succession, there is another sign which should not be neglected. In phrenitis the pulse is small and rapid, in mania the pulse is full. Finally, should it occur, as is certainly very rare, that the pulse is similar in the two conditions, one at least never sees in a case of mania, either *crodicism* (movements in which the patient seems trying to pull out threads from the bed-covers), or *carphologia* (disordered movements of the fingers, as if to seize bodies floating in the air, or to move them about in the hands). These symptoms are characteristic of phrenitis, and if they should be observed in cases supposedly maniacal, one should not hesitate in diagnosing a supervening phrenitis.²²

In stuporous and lethargic states, SORANUS notes the extreme delay or absence of all response, the difficulty in influencing patients to protrude the tongue or to return it when once protruded, the immobility with which they maintain postures in which they are placed, the neglect of the calls of nature, retention, etc.; in short, many of the symptoms which we recognise in katatonic and other stuporous states.

The last of the great ones of the Grecian epoch was GALEN (b. 131; d. early 3d century, A. D.), an ardent disciple of HIPPOCRATES, the author by his own count of more than a hundred books and one of the chief agents for the transmission to modern times of the knowledge of the ancients. GALEN was a worthy vivisector and his experiments on animals opened an entirely new field in

²² From Caelius Aurelianus, the Latin translator of Soranus; cited by Trelat.

the study of diseases of the mind. During the time of his activity the early Christians were making considerable noise in the Roman world, disputing about the relative prerogatives of soul and body, and above the turmoil we hear the calm voice of GALEN describing his experiments and his conclusions concerning the nature of the mind.

There is much contention, he wrote, as to whether the faculty of thought is merely resident in us as in a temporary domicile, or is to be regarded as a material portion of the body. Whatever be the difficulty of resolving this question, it is at least permissible to state as the result of experience that in using the trephine, if the brain be compressed, all sensation and all movement are instantly abolished. If inflammation develops in this organ, the same accidents are sometimes observed, and there is uniformly a disturbance of the thought processes. Burns on the head may lead to delirium, and blows on this part may be succeeded by a state of somnolence or stupor. Any active morbid process in the neighborhood of the brain may produce a disorder in the function of thought. It would be very desirable to know first of all in what part of this organ is the seat of the intelligence. If we were well acquainted with the physiology of the brain, we should assuredly find in its pathologic condition, both the place and the nature of the malady. As for myself, I believe that the brain is at once the seat of the voluntary movements, of the intelligence, of feeling, and of memory.

Upon the basis of his observations and experiments GALEN drew the important distinction, already suggested by ASCLEPIADES (1st century, B. C.), between primary and secondary mental affections.

It is of the greatest moment, he said, to discriminate clearly between primary disturbances and those by *consensus*, for herein lie the indications for treatment. When the brain is sympathetically affected, if the seat of the primary trouble is cured before the organ of thought has had time to undergo definite changes, the mental symptoms will speedily subside; but if on the contrary, as a result of some consensus, these changes become established, the remedial agents must be directed at the same time toward both the primary and secondary lesions. When a patient, after a period of wakefulness and delirium accompanying an attack of fever, recovers his sleep and reason with the fall in temperature, we may conclude that the brain has not been the seat of any special morbid process. A disorder is to be looked upon as established in an organ in proportion as its manifestations are enduring. If in a case of thoracic disease a persistent delirium supervenes, one must assume that the head has become the seat of an affection in so far specific that it may continue after the cure of the original thoracic trouble. This method of

looking for the place chiefly affected is of great importance for all the organs, but particularly in diseases of the brain.²⁴

With the foundation which GALEN had established for a rational psychopathology, he lacked but a single step to free himself entirely from the prevailing errors concerning the morbid processes underlying disease; but the humoral theory had become a grounded tradition, and he accepted it in common with nearly all his predecessors in the Hippocratic school.

In the brief mention which has been made of four of the greatest names of the Grecian period, it is apparent that the science of psychiatry had already attained a very high plane of development, truly comparable with the state of contemporary civilisation. The alienists of the epoch were the foremost masters of the whole art of medicine, and mind-disease and body-disease formed together the subject of one indivisible healing art.

In the *causation of insanity* practically all of the factors which are discussed in current text-books were set down by the writers of antiquity. Physical and mental causes were distinguished, and the effects of moral shock and of organic disease of the brain, or of remote organs, were recognised; likewise the modifying influence of climate and season, of age and critical times of life. The predilection of certain psychoses for the period of adolescence, and the frequent association of menstrual disorders with mental disease were noted, although, as is still often the case, the suppression of the menses was looked upon as a cause rather than as a symptom of the malady. The results of alcoholic excesses and the prolonged use of other drugs, of excessive indulgence or repression of the appetites, of protracted watching and fatigue, of exposure to extremes of temperature, of injuries to the head, of reverses of fortune, of disappointment in love, of the subjection of the mind to fear and superstition, of the sustained tension of sinew and nerve in the race for fame and fortune—all these things found place in the etiology of insanity as set forth by the Grecian school.

What was true, however, then is unfortunately still too often true, and the assigned causes of a mental attack may be only the associated circumstances, or at most contributing factors, the real root of the malady eluding our observation. Of peculiar import-

²⁴ Galen's Commentaries, from the French of Trelat.

ance, therefore, was the way which was opened by HIPPOCRATES himself for the later study of inheritance and predisposition. In the account of epilepsy he declared that "its origin is hereditary," and herein he gave form and currency to a teaching already present in the Pythagorean school. "Our tendencies toward virtue and vice, as well as toward health and disease, come rather from our parents and from the principles of which we are composed, than from ourselves." Two and a half centuries later, the element of congenital predisposition is still the factor most emphasised both in the determination of individual mental traits, and in the causation not only of epilepsy but of morbid mentality in general.

In comparison with the prevailing opinions concerning etiology and symptomatology, the ideas of *pathology* which obtained throughout the Hippocratic era, were as we have seen, strikingly ill-developed. The belief in the doctrine of the four humours and of their noxious potency in excess in determining various mental disorders, held sway from ANAXAGORAS the Pythagorean, to GALEN, and were transmitted by him through the succeeding ages. Among the great teachers of the period, only ASCLEPIADES, and his adherents, SORANUS and CAELIUS AURELIANUS, deviated from the common way of thinking, by setting up in place of the bilious diathesis, the theory of *vital force*, to a surplus or poverty of which disease was to be ascribed.

The fact, however, which was the crowning glory of the Grecian epoch, was the recognition once for all that whatever the determining or contributing factors or their manner of operation, *madness is not a manifestation of supernatural power but a disease; and not only a disease, but a disease of the brain; and that physical symptoms commonly accompany the mental ones, both being alike traceable to natural human causes.*

Finally, when the gods were stripped of the power of producing disease, they likewise ceased to be called upon to cure it; and while inevitably the empirical methods of the early physicians in many instances may have been hardly more fruitful of immediate results than the religious exercises previously relied upon, nevertheless with the transfer of authority there was created for the first time the possibility of a gradual building up of a *rational therapy* for diseases of the mind.

Among material measures, bleeding²⁸ and evacuants found perhaps widest application, and of the latter, white hellibore enjoyed great favor among the Greeks, having been borrowed by them doubtless from Egypt. Baths and mineral waters, exposure to sunlight, massage, frictions and applications to the head, modification of diet, rest in bed, isolation, music, diversion, exercise, work—such are some of the modern methods which were employed two thousand years ago.

The best chapter on treatment to be found in the writings of antiquity is probably that of CAELIUS AURELIANUS, wherein he presents the teachings of his master, SORANUS. So remarkable is this chapter, and so well does it show forth the sum of all that was best of experience, observation, and judgment in the whole era, that we pause over it with profound admiration.

Excited patients should be placed in a somewhat subdued light, in a room with a mild temperature, and where there are no disturbing noises.²⁹ There should be no pictures on the walls,³⁰ and the air should enter by elevated openings. . . . The beds should be of solid construction and so placed that the patients cannot see the door, and are not annoyed by what is passing. . . . Frequent visits, particularly on the part of strangers, are to be forbidden, and the attendants should be rigorously enjoined to repress the outbreaks of the patients in such a manner as never to irritate them by showing too much spirit, and on the other hand not, by too much laxness, to allow them to increase their extravagances. Their faults should not, therefore, be allowed to pass unnoticed, and one should use as occasion requires, a calculating indulgence, or a mild reproof, setting forth the advantages of amendment in conduct.

If the patients become violent and are controlled with difficulty, . . . several attendants should be at hand to subdue them as it were, without their knowledge and without provoking them, by approaching as if to give them massage. If they are irritated by the presence of other persons, and then only in very rare instances, may restraint-ligatures be used, but with the greatest precautions, . . . employing only bands of soft texture; for methods of repression, if injudiciously applied, give rise to or augment excitement instead of relieving it. . . . One should

²⁸ Asclepiades was practically the only one of the ancients who condemned bleeding.

²⁹ "Persons in phrensy are sharp of hearing, are sensitive to noise, and easily become delirious." (ARETAEUS, *Therapeutics of Acute Diseases*, I, 1.)

³⁰ "The walls should be smooth, level, without projections, not adorned with frieze or paintings; for painting on a wall is an excitant." (ARETAEUS.) The provoking of hallucination is also referred to.

begin giving nourishment very cautiously, and at first only the lightest and most easily digested food."²² If the evacuations are not regular, enemata must not be neglected. . . . One should carefully observe the character of the delirium, and have recourse to the salutary influence of moral impressions, diverting thoughts, or welcome news. . . .

If there be persistent wakefulness, a swing-bed may be tried, or one may resort to the continued sound of falling water, the monotone of which often produces sleep. Warm sponges applied to the lids relieve the feeling of heaviness due to prolonged watching. . . .

When the excitement declines, consciousness becomes clearer and sleep returns, nourishment should be increased and more varied; and as the patients recover their strength they should be taken for walks and given other physical exercise. . . . When the symptoms have subsided and the mind is no longer dangerously impressionable, a change of scene may be counselled. Trips by land and water, varied distractions and mental diversions, agreeable conversations and affection, may do excellent service. Ennui and the spirit of gloom are only too ready to fasten upon those who have already been their victims; and if healthy, sane men can fall suddenly into a morbid state under the influence of grief, how much more is this result to be feared in those who are convalescent or just recovered, and who are still living, as it were, in the atmosphere of their disease.

Certain harsh methods of treatment which had been suggested, for example, enforced fasting, and the régime of intimidation, mechanical restraint and even corporal punishment, indicated by CELSUS (1st century A. D.), were vigorously denounced by SORANUS. Continuing the account in CAELIUS we read:

They themselves seem to rave rather than to be disposed to cure their patients, when they compare them with wild beasts which must be softened by the deprivation of food and the torments of thirst. Misled, doubtless, by the same error, they recommend that patients be cruelly chained, forgetting that their limbs may be bruised or broken, and that it is more expedient to restrain them by the hand of man than by the weight of iron. (*Ministrantium manibus quam inertibus vinculis.*) They go so far as to advise physical violence, the whip,²³ as if by such means to force a return of reason. This deplorable treatment can only aggravate the condition, and supply unwelcome memories to salute the return of their intelligence."

²² "Abstinence from food should not be prolonged; food should be rather liquid, scanty, and frequently administered, for food soothes the soul." (ARETAEUS.)

²³ *Sunt quidam fustigandi.* (Celsus.)

²⁴ *Caelius Aurelianus, De Morbis Acutis et Chronicis*; Latin version of the work of SORANUS, not extant.

In general it must be said that during the Grecian era, enlightened and humanitarian motives prevailed in the treatment of insanity; and in the consistent attempt to make right and proportionate use of the three great therapeutic agents, drugs, mechanical measures and psychic influence, the writers of antiquity have left a standard and a pattern which must be followed through all subsequent ages.

It remains but to say a word on the psychic element of treatment, the earliest means used to combat disease. At first confined to the hands of the priests, who were the only healers, mental therapy was the only logically possible form of treatment, and it was exhausted in conjurations, invocations and other rites of the temple. By these means certain cases were doubtless suggested back to health. Next, with increasing enlightenment, came that remarkable school of priest-physicians, the sons of Aesculapius, and from our present standpoint this group constituted a sort of missing link out of which developed those great leaders in medicine whose names and achievements have been the subject of this discussion. The Asclepiadæ maintained the efficacy of the temple-element, but their god had taken on somewhat definite form; he was a divine specialist, his function was the curing of disease, and in the temple-sleep there were revealed to the patient the material means he must use to drive out his complaint. The Asclepiadæ represented a necessary step in the evolution of the physician. That step taken, however, their race died out, and the priest-physician to-day would be an anomalous atavistic phenomenon.

Through the early Greek philosophers and physicians, mental therapy came to be translated out of divine mysticism into human rationalism. The soul-diet of PYTHAGORAS served as foundation for the new system. The Pythagorean maxim, *mens sana in corpore sano*, found full confirmation in the precepts laid down by PLATO for the maintainance of health. "The health of body and soul consists in the perfect equilibrium of their forces To preserve the health of these two parts, both must receive equal exercise. He who devotes himself to study, should not neglect the exercise of the body; and he whose chief concern is physical development, should also have time for meditation and study

We should imitate nature, whose course is always uniform, without repetitions and without shocks It follows that the best remedy as well as the best purgative, is exercise." Drugs were relegated by PLATO to the last place in the physician's equipment.

The close bonds which existed between Grecian philosophy and medicine, gave to the mental therapy of the period a peculiar and efficient quality which has not always since been maintained. All patients were regarded as accessible, in some degree, to reason; they were not merely irresponsible creatures to be cared for and controlled; and on this basis a constant mental influence was exercised, by way of engaging conversation, philosophic discourses, graduated mental tasks, varied diversions, music and other artistic enjoyments, together with a sympathetic interest in the personal conditions and concerns of patients, so as to adapt explanations, exercises and requirements to individual needs and capabilities.

Love, as a psychotherapeutic agent, has been, like wine in the treatment of madness, both warmly advocated and strictly condemned. One of the most celebrated cures by this means was that of ERASISTRATUS, who relieved the melancholy of Antiochos, son of Seleucos Nicator, on discovering its cause in an unhappy love of the patient for his step-mother, the beautiful Stratonica; whereupon his father relinquished her, she became the wife of Antiochos and his malady was healed.

A story is told, wrote ARETAEUS, that a certain person, incurably affected, fell in love with a girl; and when the physicians could bring him no relief, love cured him. . . . And when he imparted the love to the girl, he ceased from his dejection, and dispelled his passion and sorrow; and with joy he awoke from his lowness of spirits, and he became restored to understanding, love being his physician.

Less sanguine is SORANUS.

It has been recommended, he wrote, to try to render insane patients accessible to love; but this passion is often enough the cause of their malady. . . . It is absurd to think that love, which is one fury, can drive out another

And so it is that the *mal sacré* of Eros has continued through succeeding centuries to play a conspicuous rôle, now in the etiology, again in the symptomatology, and even in the therapy of mental afflictions.

In the Golden Age of Greece, with all the varied and excellent

measures to which the physician had recourse, notwithstanding its lofty supremacy over the primitive priestly period, men nevertheless realised, as they do to-day, that many of the diseases of the mind are hopeless, that organic processes in the brain cannot be altogether repaired, that the burden of morbid potential which in varying degree is ever a part of our common human dower, cannot utterly be cast aside.

"It is impossible, indeed," declared ARETAEUS, "to make well all who are ill; for then would a physician be superior to a god."

(Continued in the April number.)

ARTERIO-SCLEROSIS IN RELATION TO MENTAL DISEASE.¹

By C. MACFIE CAMPBELL, M. B.,

Pathological Institute, Ward's Island, New York City.

The presence of arterio-sclerosis in cases of mental disease, especially in advanced life, is comparatively common and often appears to be of little importance.

In some disorders, however, the mental and physical impairment is intimately related to arterio-sclerotic changes of the cerebral vessels, and it is this group of cases to which attention will be directed. The rôle which arterio-sclerosis plays in the involution, presenile, and senile psychoses involves too many general questions to be more than referred to.

Cerebral arterio-sclerosis may be part of a general arterio-sclerosis, or it may exist without other vascular systems being implicated, at least to the same degree. The absence of the signs of general arterio-sclerosis does not, therefore, exclude the possibility of cerebral arterio-sclerosis. The cardinal symptoms of arterio-sclerosis are increased blood-pressure, thickened peripheral arteries, hypertrophy of the left ventricle with accentuated second sound. When in addition the patient complains of headache and dizziness, marked fatiguability and exhaustion, and failure of memory, cerebral arterio-sclerosis is distinctly indicated.

Ophthalmoscopic examination gives still more direct evidence of the condition of the cerebral vessels. In some cases one can even see the indentation of veins by the stiffened arteries, but numerous other changes are important diagnostic aids.

Cases of mental disorder based on cerebral arterio-sclerosis fall into two main groups. In the first the symptoms are less severe and more stationary, and Alzheimer calls this the nervous form of cerebral arterio-sclerosis. In the second group are included the more severe and progressive cases with a varied neurological

¹ Read at the sixty-third annual meeting of the American Medico-Psychological Association, Washington, D. C., May 7-10, 1907.

picture and extreme reduction of mental activity. This second group has been further subdivided, but chiefly upon anatomical grounds, and the clinical differentiation of the various subgroups is still incomplete. It includes among other forms Binswanger's chronic progressive subcortical encephalitis.

The nervous form of cerebral arterio-sclerosis is not uncommon and many patients are cared for at home or in almshouses. They are frequently described as cases of melancholia, neurasthenia, hypochondria, etc. The onset of symptoms usually occurs between 50 and 60, but sometimes earlier. The most characteristic symptoms are headache and attacks of dizziness, marked fatiguability, and memory defect. The headache is frequent and persistent, and may be influenced by change of blood-pressure, as during straining at stool; attacks of dizziness are common, especially in relation to change of position. Various subjective feelings are complained of—pressure on the head, flickering before the eyes, buzzing in the ears; alcohol is not tolerated so well. The patient begins to find difficulty with his work, especially in anything that goes beyond the usual routine; his store of memories is not so completely at his disposal as previously, he finds especial difficulty in imprinting new facts on his mind. He is easily fatigued and exhausted, is irritable and depressed, broods over his failing energy and exaggerates his symptoms. The condition shows little tendency to progression, and death is usually due to an apoplectic attack, cardiac disease, or some intercurrent affection such as broncho-pneumonia. Such cases may show no definite focal symptoms, or they may have transitory attacks of weakness or apoplectiform attacks leaving a permanent hemiplegia with or without additional symptoms, such as aphasia.

Post-mortem the brain may show little diminution in weight, the striking feature is the marked arterio-sclerosis of the cerebral vessels, both in cortex, white matter and basal ganglia; focal lesions may be absent. Histological examinations show certain changes in the cortex, but no marked disappearance of nervous tissue.

To illustrate this form of mental disorder based on arterio-sclerosis, a brief summary of one case may be given.

The patient was a man of good education, not alcoholic, but

with a history of syphilis in early life. About the age of 46 he became very irritable, felt played out, gave up his work; he was sleepless and restless at night, complained of numerous aches and pains, was depressed, suspicious of his wife, obstinate; he worried a great deal over his health, thought that he would become insane, dreaded commitment, talked of suicide. He was committed at the age of 55. The cardinal symptoms of general arterio-sclerosis were present, also albuminuria; in addition he complained of occasional dizziness and faintness, of ringing in his ears and intense headache. The face was smoothed out, the mouth somewhat pouting; he stated that he had occasional difficulty in swallowing liquids, but none was observed. Innervation of the left facial was defective, otherwise there was no circumscribed weakness. His gait was rather shuffling. Speech was careless and slurring, but without the tremor or sticking of the general paralytic. The writing was somewhat tremulous; he wrote "bridiade" for "brigade." On the slightest provocation, or even with none, he would develop a lachrymose facies, but was easily persuaded to smile.

Mentally he was depressed over his condition, complained of terrible nervousness and weakness, was very easily fatigued by mental operations; his memory was poor, but retention fair.

He described the onset as a gradual breaking down; "I was just like an old man—gradually gave out. I feel like 75, am only 55." He showed keen appreciation of his general impairment, tended to exaggerate physical ailments.

After five months in hospital, during which period his condition was stationary, patient had a general convulsion, which was followed by stupor, coma, and death.

Such cases as this have been described symptomatologically as neurasthenic melancholia or hypochondria, but its close relation to cerebral arterio-sclerosis is clear. In addition to the general symptoms—headache, dizziness, attacks of fainting, buzzing in the ears—emphasis must be laid on the slurring articulation, the difficulty in swallowing, the lability of emotional expression. These features at once suggest a similarity to those cases of brain disease where a picture resembling bulbar paralysis is produced by a bilateral interference with the cortical innervation of the bul-

bar nuclei for movements of the lips, tongue, and pharynx, *i. e.*, cases of pseudo-bulbar paralysis. One of the most frequent causes of this syndrome is arterio-sclerosis of the cerebral vessels. It is impossible to do more than touch the topic of explosive laughter and crying in such patients as the one just reported. Typical unmotivated explosive laughter may occur; facile tearfulness with little affect is also found. In some cases, however, the affect itself is somewhat explosive, and not merely the facial expression, and the amount of discrepancy between real affect and emotional expression is variable.

To discuss this question adequately would involve an examination of the mood in the various depressions in advanced life, and this cannot be done here.

The points already referred to show that the group of cases described above has relations on the one hand with the various depressions in advanced life, and on the other, with organic brain disease of vascular origin. In emphasizing the arterio-sclerotic element in the picture one ought not to fail to do justice to the other element—that element which has received prominence in the older symptomatological grouping of the cases as melancholia and hypochondria. This must be kept in mind in view of various unsolved problems. Why is cerebral arterio-sclerosis in some cases compatible with good mental and physical health, while in other arterio-sclerotics strength and initiative and the power of assimilation undergo marked impairment and the patient develops an abnormal mood and morbid ideas? In these latter cases what determines the onset of the impairment? The arterio-sclerosis is not acute, but the symptoms may develop rapidly. The exact part played by circulatory variations and renal insufficiency in this disorder is well worth further investigation; the literature does not contain many cases which have been fully studied from this point of view.

In the nervous form of cerebral arterio-sclerosis the mental level of the patient may remain practically stationary for years, although slow progressive decline, varied by little episodes which may necessitate commitment, is common; in some cases of cerebral arterio-sclerosis the patient may go down-hill with surprising rapidity presenting a picture of extreme general feebleness and

confusion. Such was the course in the case of a man of 51, with slight cardiac hypertrophy and mitral incompetence with no albuminuria, whose brain presented a very definite arterio-sclerosis. No adequate cause could be found for the extremely rapid decline in this case. The cases of still more pronounced mental impairment based on arterio-sclerosis are grouped by Alzheimer under the title—Severe Progressive Arterio-sclerotic Brain Degeneration. The disorder may here begin with the same symptoms as in the nervous form, but instead of remaining at the same level the patient, if he does not succumb to one of a series of attacks, may be reduced step by step to a state of the most profound dementia, in which vegetative condition he may exist a considerable time with occasional unexpected flickers of intelligence.

In the early stage, as in the nervous form, there is restlessness, irritability, a depressed and tearful mood, considerable mental sluggishness, difficulty of recalling and using the store of memories, impaired ability to receive and retain new impressions. As the disease progresses the mental processes become still more sluggish, the patient's store of ideas becomes more and more impoverished, elaboration of new material ceases, life becomes almost vegetative. From the first one notices that the mental possibilities of the patient show considerable variation from time to time; and even in the advanced stages there are brighter moments when he gives evidence of transitory grasp of environment or may utter fragmentary references to past incidents; the persistence, even in the latest stages, of insight into his unfortunate condition is very striking.

The dementia reaches a degree comparable to that of the general paralytic; but it is rather an extreme reduction than a total disintegration; the elements left are fragmentary, but not distorted nor grotesque.

Such is the general scheme of the mental decline, but this is diversified by various morbid ideas usually of a depressive or persecutory nature; from time to time there are delirious incidents, episodes of bewilderment or uneasiness, attacks of excitement with delusions and hallucinations. The history of the physical decline may be very complicated and include attacks of different kinds, with a great variety of residual defect symptoms; in

these cases one has the opportunity of studying hemiplegic attacks, transitory or permanent hemianopias with the phenomena of conjugate deviation, aphasias, asymbolias, and a great variety of irritative phenomena. The neurological episodes include attacks of dizziness, general epileptiform attacks, apoplectiform attacks, attacks confined to localized twitching. During these latter attacks the patient may be quite conscious and converse with the physician, or he may only make fragmentary delirious utterances, or consciousness may be lost altogether.

The resulting defect symptoms give rise to a very complicated neurological status. In addition the pupils may be sluggish or quite rigid. The speech is usually slurring. A moderate lymphocytosis of the cerebro-spinal fluid is sometimes found.

The brain shows a more severe degeneration than in the nervous form of cerebral arterio-sclerosis. The weight is usually diminished, and the white substance shows very pronounced changes, while numerous focal softenings may be present.

Clinically it may be very difficult to diagnose such a picture from dementia paralytica with focal symptoms, and from senile dementia with focal symptoms. In general, as Alzheimer says, the paralytic and senile dement strike one as insane; while with the arterio-sclerotic dement the "crazy element" in the picture is less striking. The physical signs of general paralysis with the crazy ideas and general mental disintegration usually enable the diagnosis to be made; while the typical senile dement with focal symptoms shows a distinctive mental picture in which disorientation, a tendency to confabulation and crazy ideas are prominent features.

These general diagnostic points are, however, insufficient, and the relation of the senile psychoses to arterio-sclerotic dementia is complicated. Even patients presenting the less severe form of cerebral arterio-sclerosis may have episodes which are indistinguishable from those of the ordinary senile dement. We know little about the ætiology of senile dementia, and of its various forms. It is possible that in certain cases of arterio-sclerosis there is a combination of phenomena due to the vascular changes with others of so-called senile origin.

The term arterio-sclerotic dementia is justified by the promi-

nence both clinically and anatomically of certain changes of vascular origin, but it must be emphasized that the whole picture is very complex, and that the complication of arterio-sclerosis with senile or other changes is not to be excluded.

Correlation of definite focal lesions with certain neurological symptoms is possible, but any detailed correlation of mental defects with anatomical changes is premature.

A patient at present under observation illustrates well the limits of our knowledge with regard to the organic dementias. He is a man of 60, profoundly demented, who now only shows signs of mental activity by uttering occasionally an almost inarticulate remark.

At the age of 45 he began to fail mentally; at the age of 58 he had a general convulsion, and was admitted to hospital. During the two years of hospital residence he has shown progressive decline, such as one meets in severe progressive cerebral arterio-sclerosis; he has manifested no delusions, and has even in the late stages shown remarkable persistence of insight into his general impairment. The neurological history has been varied; attacks of different kinds have been frequent. Right-sided hemianopia and right-sided sign of Babinski are permanent residuals from attacks in hospital. Numerous attacks consisted in transitory left-sided hemianopia, irritative and paralytic phenomena in the left face and arm, and anæsthesia of the same region. The knee-jerks have been absent since admission to the hospital; the cerebro-spinal fluid shows a well-marked lymphocytosis; the sign of Romberg has been observed. Since admission the pupils have become more and more sluggish and somewhat irregular; the speech is extremely slurring, but not suggestive of general paralysis.

Peripheral arterio-sclerosis is well marked with high blood-pressure and cardiac hypertrophy; there is no evidence of renal insufficiency.

The general nature of the mental reduction is similar to that in severe progressive cerebral arterio-sclerosis. The irritative and paralytic phenomena are compatible with cerebral arterio-sclerosis, but our present knowledge of such attacks has too little definition for them to give much aid in the diagnosis.

The absence of knee-jerks, sign of Romberg, marked lymphocy-

tosis in the cerebro-spinal fluid, sluggish irregular pupils, force one to reserve the diagnosis; for it is not as yet sufficiently established what weight is to be laid on these signs, individually and collectively, in the clinical differentiation of the organic dementias.

The presence of epileptiform convulsions in cerebral arterio-sclerosis has already been mentioned; in some cases these convulsions are the most prominent feature of the disease. The patient may show no mental impairment, or the convulsions may occur along with other characteristic physical and mental symptoms. That the circulatory system has an important relation to the convulsions is shown in some cases by the results of treatment of the cardio-vascular disorder. The fact that in certain arterio-sclerotic epileptics compression of the carotids may bring on convulsions points in the same direction.

In young epileptics with valvular lesions the occurrence of fits in positions which embarrass the circulation, and the reduction of the number of fits under cardiac stimulants, confirm this point of view.

That renal incompetency may be in some cases an important element is possible, but well-marked cases of senile epilepsy may show no evidence of kidney trouble. Even though the cardio-vascular disorder may explain the occasion for the occurrence of the fit, it does not explain why only certain individuals should give this reaction to the disease. This question is quite obscure, and one must admit that the ætiology of senile epilepsy is in the same condition as that of epilepsy in young life. As to the general symptomatology of those cases of senile epilepsy with pronounced arterio-sclerosis, in the intervals between the fits the patient may show little defect, or he may show, in more or less pronounced degree, the symptoms characteristic of the nervous form of arterio-sclerosis. The attacks may not be limited to general convulsions.

A patient 63 years of age, at present under observation has, in addition to typical epileptic fits, shown a variety of attacks without any motor implication. The attacks have been of the nature of a transitory loss of consciousness of a few moments' duration, or of transitory confusion, or of a "Dämmerzustand," or delirious episodes, or of episodes of exaggerated irritability, suspicion, and indignation with ideas of reference, and possibly hallucinations.

This patient has excellent insight between the attacks and is keenly aware of his poor memory and retention; he has a permanent tendency towards ideas of reference. Of late he has developed certain ideas of greatness, a rather unusual feature.

SUMMARY.

I. While arterio-sclerosis of some degree is a commonplace finding in cases of mental disorders, especially in advanced life, there are cases where the cardio-vascular disorder seems to be the central element in the clinical and anatomical picture.

II. Certain cases symptomatologically described as melancholia, hypochondria, neurasthenia, etc., may be better grouped on etiological grounds as cases of arterio-sclerotic brain disorder; while the arterio-sclerosis is an important factor, the factors which led to the symptomatological grouping are not to be neglected. This necessitates the analysis of the depressions in advanced life.

III. In certain cases of organic dementia the arterio-sclerotic changes are obviously the most important element in the process and the term arterio-sclerotic dementia is justifiable; but the relation of certain mental symptoms to similar ones in the presenile and senile psychoses must be kept in mind. This necessitates the analysis of the presenile and senile psychoses.

It is premature to correlate the whole symptomatology with the arterio-sclerotic part of the anatomical findings.

IV. The neurological picture in advanced cerebral arterio-sclerosis is still ill-defined; and for the differential diagnosis of the various organic dementias further clinical material is required.

V. In certain cases of epilepsy with onset in late life, the convulsions and general symptomatology are closely related to arterio-sclerosis.

Proceedings of Societies.

NEW YORK PSYCHIATRICAL SOCIETY.

STATED MEETING, NOVEMBER 6, 1907.

Dr. Adolf Meyer, President, in the chair.

PRELIMINARY REPORT ON THE SIGNIFICANCE OF THE OCULAR SIGNS AND SYMPTOMS OF DEMENTIA PRÆCOX AS OB- SERVED IN A SERIES OF 115 CONSECUTIVE CASES.

By DR. H. H. TYSON AND DR. L. PIERCE CLARK.

The cases were from private practice, clinics, and the metropolitan asylums. Definite changes were invariably found. The fundus changes, as seen clinically, are divided into three stages, in the order of their occurrence. First stage, congestion of the discs, hyperæmia and œdema, dilated veins, contracted arteries, and blurring of the edges of the discs, of varying degrees, constituting a low grade perineuritis of the optic nerve. Second stage, congestion of the nasal side with temporal pallor of discs, dilated veins and contracted arteries. Third stage, pallor of discs, dilated veins, and contracted arteries, constituting partial or complete atrophy of the optic nerve.

All forms of dementia præcox were under study. The more rapidly deteriorating forms show the most marked changes. The cases embraced both users of alcohol and tobacco, and abstainers. Theoretically, the changes are probably due to a vascular toxin from liver or intestinal auto-infective origin. A vascular alteration with œdema takes place, resulting in disturbances of nutrition and slow degeneration of the nerve fibers. Cases in the first stage have shown fundus improvement under the usual treatment for intestinal auto-infective toxæmias.

Other eye symptoms found uniformly were: Enlarged pupils, negative sensory reflex, negative psychic reflex, negative Piltz

reflex, diminished corneal sensibility, and concentrically contracted visual fields. No other psychosis presents similar conditions. The findings should be found useful in differential diagnosis, to a certain extent in prognosis, and possibly in the study of the pathogenesis and pathology of dementia præcox. Cases illustrative of the three stages were demonstrated to those members who used the ophthalmoscope.

DISCUSSION.

Dr. C. E. Atwood, of New York City, had followed the investigations of Dr. Clark and Dr. Tyson, having seen nearly all the cases examined by them, and now looks for the changes in the optic disc and the other eye symptoms in every case of dementia præcox which comes under his observation. In no case so far had he found the symptom-complex wanting. Recently, at the suggestion of Dr. Clark, he had been studying cases of infection, *e. g.*, lead poisoning, quinine poisoning, and cases of typhoid fever and pneumonia, etc., in the hope of finding some similar changes in these conditions which might be of similar origin. Dr. Atwood read the findings in a number of cases examined. In five men with typhoid infection, averaging about 26 days' duration, four of whom smoked and drank, all showed haziness of the disc with some blurring of the edges and fullness of the veins. In one (the non-drinker and non-smoker) there was limitation of the fields to about 30 degrees. In one only (of six weeks' duration) there was an appearance of central fullness (œdema?), the cup not showing. In four women with *typhoid*, averaging 26 days' duration, the discs in two cases were normal and in the other two, anæmic, the vessels being less full and the surface pale. In three men with *pneumonia*, all of whom smoked and drank moderately, the fundus in one was normal, and in the other two there was haziness of the edges of the disc with fullness of the veins, but no œdema. In two *post-operative septic* cases, one a gangrenous appendicitis, the other an intestinal perforation, both exhibited haziness and venous enlargement, but no œdema. Both of these cases used alcohol and tobacco. A man with partial amblyopia from *quinine poisoning* (case of Dr. Tyson's) who neither drank nor smoked, showed haziness, congestion and œdema of the nasal

side, with fullness of the veins and pallor on the temporal side. Central scotoma was also present. The vision was 2/200 right, 20/100 left. The last case reported was one of infection from lead. A man, aged 44, born in Germany, drank beer, had slight arterio-sclerosis, and had the occupation of making white lead in a factory. For seven months he had had double wrist-drop, and been under treatment in a neighboring town for this and lead colic, etc. Both discs exhibited central œdema, pallor, and enlarged veins. The fields were contracted to 15 degrees for red, 10 degrees for green. There was central scotoma principally for red. V. = 20/30. The examination of seriously ill patients, *e. g.*, with typhoid, etc., at Roosevelt Hospital, was facilitated through the kindness of Professor James, and made possible by the use of the electric ophthalmoscope.

Dr. William Mabon, of New York City, read the report of the findings in examinations of the fundi of 25 patients with dementia præcox and 25 with manic-depressive insanity at the Manhattan State Hospital. These examinations had been made by Dr. Holden, whose report was as follows: "Blin has reported in a series of observations of dementia præcox patients, a persistent congestion of the optic disc in 10 per cent, a persistent anæmia in 8 per cent, and an alternating congestion and anæmia in 6 per cent, with intermittent congestion or anæmia in 45 per cent more. However, I wish to say that the color of the optic disc varies within wide physiological limits and many of us do not like to speak of congestion or anæmia of the disc unless the condition is pronounced and palpably abnormal. In none of these 100 eyes examined did I find a congestion or an anæmia that seemed to me significantly abnormal. The color of the disc may be said to depend largely upon the personal equation of the examiner. In the 25 patients with dementia præcox, the outlines of the discs were blurred more than in the average normal eye in 11 patients. In 6 of these 11 the large veins of the disc and retina were appreciably dilated. In the 25 patients with manic-depressive insanity, on the contrary, there was a blurred outline of the discs in but four patients, and in but two of these were the large veins appreciably dilated. This blurring of the outline of the discs is in many cases of dementia præcox too pronounced to be considered physio-

logical and must be regarded as pathological. It is due to cloudiness of the nerve-fiber layer of the retina and optic nerve, which in some cases seems to be caused by a cloudy swelling of the nerve fibers which can be individually made out, and in other cases perhaps to an œdema of this layer without swelling of the fibers, or in other cases perhaps to both of these causes combined. In half of the cases in which the outline of the discs was blurred the veins of the retina were, as compared with the arteries, abnormally dilated. The condition may be analogous to the circulatory changes and œdema found in other parts of the body in dementia præcox. In some cases it is so pronounced as to give rise to a characteristic picture, and from the examination of these 25 patients and of about an equal number previously examined, of which complete statistics were not kept, I should judge that the condition was to be found in about half the cases of dementia præcox and rather exceptionally, and in a less pronounced degree, in manic-depressive insanity." In view of Dr. Holden's statement that the condition was to be found in about half of the cases of dementia præcox and exceptionally in manic-depressive insanity, it would seem advisable to make further investigations before reaching the conclusion that these conditions are of diagnostic significance.

Dr. P. C. Knapp, of Boston, called attention to the importance in these cases of refraction errors. In a considerable number of cases of brain disease, especially in cases of headache, he had found such a congestion of the optic disc as had been described, with blurring of its outline so great as to suggest beginning neuritis, but due, as further investigation showed, to a considerable degree of hypermetropia. It would be well to eliminate the possibility of refraction error before assuming changes in the optic disc. Dementia præcox was not the only mental disease, as suggested by Dr. Tyson, in which these changes are noted. They occur in general paralysis in a number of cases, although they are less frequently seen than conditions of optic atrophy. He had seen a number of cases where there was congestion of the disc and haziness of outline in which the changes were indubitably those of low-grade neuritis.

Dr. Adolf Meyer, of New York City, remarked that in order to

prove that we are dealing with an inflammation and subsequent atrophy of the optic nerve, it would be very desirable to have sufficiently strong evidence of functional disorders of vision. In the absence of visual defect in cases of remission, etc., it remains to be shown that the appearance of the disc is not merely an incidental phenomenon of a general vasomotor difficulty.

Dr. Clark, in closing the discussion, said that in a number of cases at the Vanderbilt Clinic followed independently by Dr. Holden and by Dr. Tyson and himself, the results tallied exactly so far as the disc changes were concerned. In the report just presented Dr. Holden seemed to take it for granted that the only changes were congestion and haziness, whereas these formed only a part of a series of changes. These changes would not be noted unless the entire series were followed. Careful analyses in other types of mental disease had failed to reveal changes which could be confounded with those described. The different phases of the changes described, ranging from the congestive stage to the terminal one of general diffused atrophy of perineuritis, should be borne in mind, otherwise it is impossible to arrive at statistics. Of course there were optic changes in paresis, but this was not often to be differentiated from dementia præcox. He had made it a point to look for the physiological cupping of the disc, and if this could not be noted to look for other features that go with dementia præcox. One hundred and fifteen cases, the number studied, would not *establish* any of these changes for diagnostic purposes. The work, as stated, was but a preliminary communication and must be verified by more exhaustive studies by many different observers before this eye syndrome could be finally considered as definitely established. The significance of these clinical features was tentative, and might undergo modification, but after two and a half years of investigation he was convinced that there is a characteristic toxic change going on in dementia præcox which must be recognized as a feature of the disease, possibly rendering it a somatic disorder with a mental accompaniment.

Dr. Tyson, in closing the discussion, said, with reference to errors of refraction, that it was only in high degrees that congestion of the disc was found, and that high hypermetropia was found in only one per cent. In atrophy it was only by contraction of the

field and diminution of visual acuity, with cupping and pallor of the discs and contracted arteries, that the diagnosis was made; and finally that in using the ocular signs and symptoms to aid in making a diagnosis, the entire eye symptom-complex should be used and not only the appearance of the fundus oculi.

THE ANXIETY PSYCHOSES.

Dr. George H. Kirby, of New York City, read this paper. The affect of anxiety is of wide occurrence and appears in a variety of psychoses, yet our clinical experience teaches that there is a group of cases in which the anxiety appears to stand out more or less as a fundamental symptom and not in association with additional features that would stamp the disorder as belonging with any other well recognized symptom-complex. These anxious depressions occur mainly in the climacteric period or later in life, yet similar symptom pictures occasionally develop in earlier years. Kraepelin's recent proposal to merge the anxious depressions into the manic-depressive group as "mixed forms" was argued against by the author, who showed that Kraepelin was led to this change of position chiefly because he found that nearly all of the surviving cases of involution depression had terminated in recovery even after a prolonged course. This generalization exemplifies to what an extreme degree the Kraepelinian statistical method may be pushed. The author's material afforded many reasons for keeping the anxious depressions apart from the manic-depressive psychoses—they appear to arise out of a different etiology, show important symptomatological differences, run a different course from the manic-depressive cases and are especially dangerous to the life of the patient. Various factors were mentioned which seem to prepare the ground for the origin of the anxious affect, *e. g.*, intoxications, organic insufficiency, advanced age, etc., and attention was drawn particularly to the great frequency with which the anxious mood arises out of prolonged worries and chronic emotional strains of various kinds. Cases were reported to demonstrate the importance of these psychogenetic elements in the development of the psychoses with anxiety. The cases studied fall into several groups each of which seems to have some prognostic significance. (1) Cases showing a simple form of anxiety

or general uneasiness, apprehensive anticipations with or without ideas of sin. (2) A severer form showing anxiety, with fear, perplexity, and allo-psychic concepts. (3) Cases presenting the sensory-somatic complex, hypochondriacal trends and feelings of unreality. (4) Cases developing with arterio-sclerosis. The anxious depressions here described are not regarded as a special form of disease, but are considered rather as a type of reaction of fairly characteristic form in the evolution of which a number of factors participate; the psychogenetic features appear to be particularly important. There seems to be a difficulty in adjustment to a situation which would naturally put the patient into an anxious frame of mind. In a smaller group of cases the physical causes seem to be most important and arterio-sclerosis is especially apt to be accompanied by an anxious depression.

DISCUSSION.

Dr. William Mabon, of New York City, was of the opinion that the anxieties should be kept separate from the manic-depressive group.

Dr. August Hoch, of Bloomingdale, said: "Dreyfus tries to show that melancholia is merely a phase of manic-depressive insanity. Kraepelin agrees with him, as he states in the introduction which he wrote to Dreyfus's book. But to do Kraepelin justice, we must remember that he specially mentions the fact of the differences in duration in the two groups of cases. While Dreyfus has made a valuable contribution in having shown that what most of us, with Kraepelin, regarded as permanent mental dilapidation, is in reality a recoverable condition; there is little gained by merely identifying the two groups of cases. There is no doubt as to a certain relationship, but there is also no doubt as to the differences, and we would have to say that these cases of melancholia are manic-depressive depressions under special conditions with special features and with certain peculiarities in course. It seems to me that we may regard the development of the anxiety and the unreality complex in depression, in other words, those features which characterize the involution melancholias, somewhat in the light of complications, very much as we regard complications in other diseases. By this we emphasize on the one hand

the relationship and on the other hand the differences. I, therefore, quite agree with Dr. Kirby that it is more profitable to keep the two groups separate. I am also very glad that Dr. Kirby emphasizes the psycho-genetic factors in the development of these cases, and I am quite sure that the work of Dr. Meyer and of Dr. Kirby in this direction is of great value, as it calls attention to many facts which are clear enough when one looks for them, but which have often been singularly disregarded."

Dr. A. R. Diefendorf, of Middletown, Conn., was inclined to agree with Dr. Kirby in his contention for the maintenance of the anxiety psychoses. In his own experience the melancholia of involution was not as prevalent as he had formerly believed. There were cases developing in the involutional period which show anxiety, but are also accompanied by considerable psychometer retardation. These cases which tend to recur should not be confounded with the anxiety psychosis, as they rightfully belong to the manic-depressive group. He had failed to note psychogenetic factors in the origin of his cases as being particularly prominent. In view of the fact that there is often a long prodromal period during which the patient is introspective, symptoms of the disease may be mistaken for psychogenic factors, that is, the patient fails to exhibit anxiety over troubles that have long existed in their life, until they show the first signs of the disease. With reference to the group designated by Dr. Kirby as the arterio-sclerotic group, he saw no reason why they should not be considered as cases of arterio-sclerotic insanity.

Dr. Charles L. Dana, of New York City, said that in private practice one sees many of the anxiety psychoses, though not of so severe a type as those described by Dr. Kirby. It undoubtedly made a clean-cut clinical picture, and to recognize it as a distinct form of melancholia was helpful in the prognosis and in the treatment. At the same time, the more he saw of melancholia the more it seemed to him that the "anxiety complex" occurs not only in the involutional period, but in early life. It was his experience that nearly one-half of the cases of involutional melancholia coming on after 50 or 40 give a history of one or two attacks of "neurasthenia" years before, these often being mild psycho-neuroses calling for no special attention from the psychiatrist. With refer-

ence to the psychogenetic factor, he believed that the patients who develop these involuntional psychoses are generally men and women of rather inferior mental caliber or persons who have worked in an environment which was too strenuous for them, and which, consciously or unconsciously, pulls them down. He could not recall any really brilliant mind that has suffered from involuntional insanity. The women belonged to the type of women who have been worriers all their lives, who have had "precisions" and constant anxiety over details, and who were not fitted to carry on easily the work they are appointed to do. Melancholia in all its phases was the same thing, but occurring in different individuals it produced the differences noted. The same definite lesion occurring in one individual would produce melancholia with anxiety, in another retardation and apathy, and in still another, in addition to anxiety there may be self-accusation, or hypochondria. The differences in the clinical picture were due to the original differences in the make-up of the individual. He would represent melancholia by the term X which meant a definite unknown lesion of the psychical apparatus, some break in association-paths, perhaps, the special characters, of self-reproach, depression, anxiety, retardation, would depend on the physique and character of the individual patient.

Dr. Adolf Meyer, of New York City, pointed out how, after all, a new standpoint, such as that of Kraepelin, of dividing all mental diseases into non-dementing and dementing processes is apt to tend to become a sort of all-embracing system with very few subdivisions. The welcome awaking of interest in the outcome of the disease has finally been pushed to the position of a logical decision which naturally must either fit or not fit; but such division of all mental disorders would ignore many other matters which have long been thought of and cannot be neglected. The fact that the outcome issue had been neglected for such a long time was no reason for making it an all-embracing issue for all decisions. To argue merely about the outcome would again lead to a great deal of guessing, and from a didactic point of view it would be better to fix the attention upon what is seen in the patient at the time of examination. It would be a much better working principle to try to recognize the concrete difficulties under which the patient la-

bors, to examine the factors which led up to these difficulties, and to estimate the balance of the forces of the individual to meet the situation. This, in practically all cases of manic-depressive insanity, would naturally lead to the recognition of a non-dementing disorder in harmony with Kraepelin's nosology. Dreyfus's claim that the anxiety depressions are mixed conditions of manic-depressive insanity is another overstretching of a fruitful principle. As soon as one constructs mixed conditions of manic-depressive insanity, practically everything, even normal mental activity, can be included in this category. We already hear that hysteria should be included in the depressive psychoses. With regard to the psycho-genetic nature of the process, he was inclined to consider Dr. Dana's remarks very well to the point. Dr. Diefendorf's exception to the issue might hold for some cases, but it was absolutely undeniable that there is a larger percentage of palpable causes for a depression than in the ordinary manic-depressive insanities. Many manic-depressive depressions in the involutional period begin to show anxieties. As soon as manifestations of manic-depressive features were noted one had symptoms which were of prognostic value. But the fact remains that the pure anxiety states for etiological and practical reasons form a group worth differentiation.

Dr. Kirby, in closing the discussion, referred to Dr. Gregory's suggestion that anxiety is largely a general symptom which occurs in a number of psychoses and recalled the fact that he had emphasized this point in his paper. Anxiety is a prominent feature in a variety of disorders, associated, however, with additional symptoms sufficient to mark the psychosis as belonging with some one of the better known types, thus the anxious alcoholic cases mentioned by Dr. Gregory usually presented distinctive features, particularly in their evolution. He would agree with Dr. Diefendorf's suggestion concerning the grouping of the arterio-sclerotic cases, but in many agitated depressions the arterio-sclerotic basis is apt to be under-estimated or even over-looked for a considerable time, perhaps until some definite cerebral attack occurs. When the arterio-sclerotic nature of the disorder is clear, the proper group would be, of course, the organic brain diseases. He could not subscribe to Dr. Dana's conception of melancholia as a general

disorder or a single disease, no matter whether it belonged to the manic-depressive or involution type of depression. The cases studied show that the two forms of reactions, certainly when they are pure, are symptomatically and prognostically different and above all they seem to develop on a different foundation. Provision must be made for a small number of cases which seem to show admixtures or appear to be transitional forms. Many cases of manic-depressive insanity show anxiety, but here it is usually found in a fairly characteristic setting. These cases have nearly always a feeling of insufficiency or show clearly some difficulty of thought or constraint in activity which does not appear in the anxiety psychoses described.

NEW ENGLAND SOCIETY OF PSYCHIATRY.

Dr. Chas. W. Page, presiding.

The regular semi-annual meeting of the society was held with Dr. E. V. Scribner, at the Grafton Colony of the Worcester Insane Asylum, North Grafton, Thursday, September 19, 1907. In the absence of the president, Dr. Philip C. Knapp, the vice-president, Dr. Charles W. Page, presided. The paper, "The Cytological Study of the Cerebro-spinal Fluid, by Alzheimer's Method, and its Diagnostic Value in Psychiatry," by Drs. Henry A. Cotton and J. B. Ayer, was read by Dr. Cotton. Dr. Ayer arranged the microscopical demonstration. The following is an abstract of the paper:

The method of Alzheimer for treating the cerebro-spinal fluid, published in the *Centralblatt für Nervenheilkunde und Psychiatrie*, June 15, 1907, forms the basis for this investigation.

In the opinion of the authors, this method is by far the best devised for studying the cells of the cerebro-spinal fluid as an aid to diagnosis in mental diseases.

Alzheimer makes use of the precipitation of proteid matter in the fluid by alcohol, and combining with this centrifugalization of the mixture. The cells are caught in the coagulum formed, and the coagulum is then treated as tissue, and the usual stains used

in studying the histopathology of the cortex can be used. In detail the method is as follows:

1. Lumbar puncture in the usual manner.
2. Ninety per cent alcohol, to twice the amount of cerebro-spinal fluid, is added drop by drop and well mixed.
3. Centrifugalize the mixture for one hour at high speed in a glass tube with conical end (an ordinary electric urinary centrifuge can be employed). The tube should be closed to prevent evaporation.
4. The supernatant fluid is poured off, leaving a small coagulum in the bottom of the tube.
5. Add absolute alcohol, alcohol and ether, and ether, each separately for one hour to dehydrate and harden the coagulum.
6. The coagulum can now be gently loosened from the bottom of the tube with a long needle. The tube is then inverted and the coagulum allowed to fall into the palm of the hand. (Usually a quick tap with the tube is alone necessary.) Care must be taken not to squeeze or handle the coagulum. The hand is placed over a small homeopathic vial, containing thin celloidin, and the coagulum allowed to drop into the celloidin. Keep in thin celloidin over night (12 hours).
7. Coagulum placed in thick celloidin which is allowed to harden slowly.
8. Mount coagulum on blocks and cut sections at 14 micra.
9. Staining. Before staining, the celloidin should be removed by allowing the section to remain a few minutes in absolute alcohol and ether. The stains best adapted for these sections are Unna's polychrome methylene blue and Pappenheim's pyronin—methyl green. The latter was found to be the most satisfactory routine stain, as it gives excellent nuclear pictures, and is specific for plasma cells, staining the protoplasm a deep red or pink.

The pyronin stain is made as follows:

Methyl Green	0.30
Pyronin	0.25
Alcohol, 96%	2.50
Glycerine	20.00
5% Aqueous solution carbolic acid.....	1.00

I. Procedure.

1. Remove celloidin by absolute alcohol and ether.

2. 80 per cent alcohol.
3. Water.
4. Sections are carried on glass or platinum needle into dish of stain which is kept in a water bath at 40° C., 5-7 min.
5. Quickly cool dish in running water.
6. Wash out all superfluous stain in plain water.
7. Absolute alcohol to differentiate, until no more stains come away from section.
8. Clear in bergamot oil.
9. Mount in balsam.

Toluidin blue can be used in the usual manner. Instead of celloidon imbedding, paraffin can be used with alcohol or Zenker fixation. The only advantage of the paraffin imbedding is that sections can be cut thinner. Alzheimer's method has a distinct advantage over other methods, because by it the cerebro-spinal fluid can be treated and stained as tissue, and thus allow comparison of the cells of the fluid with cells of the cortex and pia stained by the same methods.

The cells found in the fluid are (1) lymphocytes characterized by a small round nucleus, sometimes slightly oval. The chromophilic elements are arranged in "clock face" form around the periphery and stain dark blue (pyronin). There is very little protoplasm, usually only a thin line around the periphery of the nucleus, and stained a faint pink. They are present in cerebro-spinal fluid from all cases, but in very small numbers except in fluid from general paralysis. Here they form the principal increase in the number of cells seen. They vary from 33 per cent to 94 per cent in general paralysis, averaging 73 per cent of the total count. Their total count averages 450 to 100 fields (No. 4 ocular, 1/12 oil immersion). In other mental diseases they never reach more than 50 to 100 fields, so that a count of 100 to 100 fields is indicative of general paralysis.

2. Endothelial cells. These are a constant finding in all fluids examined (except one case of neurasthenia). They vary considerably in size and shape, and often they are the largest cells found in the fluid. The nucleus is eccentrically placed and is oval or "horse shoe" shaped. The nucleus is large, stains a faint blue, and very few chromatophilic granules are present. The proto-

plasm varies in amount, and takes a faint pink with pyronin stain. These cells are easily distinguished from lymphocytes because of the lack of chromatophilic granules in the nuclei, and the difference in shape of the nuclei. They become phagocytic for lymphocytes under certain pathological conditions, and the average count of these cells in general paralysis is 23 per cent. In other conditions they are usually in excess of lymphocytes.

3. Phagocytes. Under certain morbid conditions, endothelial cells become phagocytic, especially for lymphocytes, although they may take up cells of their own type. While they have been described as occurring in the tissue, they have not been observed before in the cerebro-spinal fluid. The nucleus is pushed toward the periphery, somewhat elongated and flattened, and the protoplasm is swollen to enormous proportions. The lymphocyte is centrally placed, and is surrounded by a light area or court. The outline of protoplasm of the endothelial cells is only seen as a faint line outside of the lighter court. The lymphocytic inclusion is often undergoing digestion or regeneration, and may present various shapes and types.

Phagocytes are rare in living fluids in four out of sixteen fluids of general paralysis ante mortem, but they were found in eight out of twelve cases post mortem, and the percentage was larger. Their significance at present is doubtful. They were only found post mortem in general paralysis and organic dementia, except for one cell found in a case of manic depressive insanity.

4. Plasma cells. These cells from a diagnostic standpoint are the most important cells found in cerebro-spinal fluid and can be considered as pathognomonic of general paralysis, and are of equal value with a lymphocytosis. They differ but little from the same cells found in the adventitial sheaths of blood vessels in the cortex. The nucleus is similar to that of the lymphocytes, the "clock face" arrangement of the chromatophilic granules is more pronounced than in the lymphocytes, and the nucleus is larger and stained a deeper blue. This is eccentrically placed. The protoplasm stains a deep red or pink by pyronin. The amount of protoplasm is usually large, but varies according to the stage of cell growth. Occasionally two or more nuclei are seen in the cell, and these cells are probably degenerated forms.

They occur in small numbers, varying from 1 per cent to 6 per cent, averaging 2 per cent in 19 cases, but take part in the general cell increase post mortem. Usually they are easy to identify when stained with pyronin, as no other cells take so deep a red, and the nucleus is quite characteristic.

5. "Körnchen" cells, or compound granular cells are another type of phagocytic cells, but differ from the first type, in the fact that they are loaded with fat droplets. They were found only in insane with cerebral softening, post mortem. Their value when found in the living would be to show the presence of an area of softening breaking into the ventricle. They are very large cells with small nucleus placed on the periphery, and by pyronin, the fat droplets do not stain, but have a dark brown appearance. By Scharlach R., they stain a deep red, characteristic of fatty pigment.

6. Polymorphonuclear leucocytes. These cells occurred in the fluids of cell cases of general paralysis, varying from 1 per cent to 39 per cent, even in clear fluids, also in other conditions (also clear fluids), where they are found, however, in large numbers. With few exceptions, their presence is accounted for by contamination while making the puncture. Their presence could not be correlated with any clinical manifestations, but they are more constant in general paralysis than in other conditions. At present their significance is not clear. Cornell found them increased after epileptiform seizures. But the difficulty of excluding contamination, even when the fluids are apparently clear, has to be considered before too much weight can be given to them.

7. Undifferentiated cells. To this class belong cells that do not conform to the types above described. In some instances they may be degenerated or altered forms. Some cells resemble fibroblasts, and others ependymal cells, but they occurred in small numbers usually, and are of little significance.

Diagnostic features. The unit of 100 fields has been adopted because of the low cell counts in other conditions than general paralysis.

The total cell count in general paralysis varied from 110 to 1500 per 100 fields, the average for 19 cases being 450. The average differential count given in these cases were:

Lymphocytes	73%
Endothelial cells	13%
Plasma cells	2%
Phagocytes (9 in 4 cases)	1%
Polymorphonuclear leucocytes	9%
Unclassified	2%

The large increase of cells in general paralysis is due to a lymphocytosis, which with the presence of plasma cells is positive for general paralysis.

A high total cell count may not be due to a lymphocytosis, but to the presence of polymorphonuclears. A count of 100 cells to 100 fields, with the largest percentage lymphocytes is significant of general paralysis.

These conclusions are based upon the examination of the fluids in 82 cases of all types of psychoses, especially those that would be confused with general paralysis. The difference in the total cell count, also the differential count in general paralysis and other psychoses is striking, and can be seen by consulting the following chart. Post mortems were obtained in 18 cases, and the clinical diagnosis was confirmed by the study of the cortex, but of this series 10 cases were general paretics. The findings in the fluid were correlated with those in the cortex and pia, and all cells found in the fluid were identified in the pia. Fluids taken post mortem showed a considerable increase in the number of cells. This was especially marked in general paralysis and organic dementia.

SUMMARY.

1. We cannot but regard Alzheimer's as the best method yet devised for the cytological study of the cerebro-spinal fluid, the good results depending upon rapid fixation of the cells and the subsequent treatment of them as if they were tissue.
2. A good differential count and a fair quantitative count are possible by this method.
3. The cells regarded by us as of greatest diagnostic importance are the plasma cell, the phagocytic endothelial cell, the fatty granule cell, and the lymphocyte if in excess.
4. In psychiatry the cell picture in general paralysis stands out distinctly from that of the other forms of insanity, the latter being considered by us as nearly normal fluids.

SUMMARY OF CELL COUNTS, ANTE-MORTEM FLUIDS.

No. of Fluids	Diagnosis	Cells in 100 fields, (Variation)	Cells in 100 fields, Average	Lymphocytes %	Endothelial cells %	Plasma cells %	Phagocytes %	Polymorphonuclear Leucocytes %	Unclassified %
19	General Paralysis.....	110-1500	450	73	13	2	1% (4 cases)	9	3% (7 cases)
10	Organic Dementia.....	8-80	22	+	+	...	...	+	...
3	Senile Dementia.....	7-31	17	+	+	...	...	...	...
2	Polyneuritic Delirium.....	20-24	22	+	+	...	...	+	+
1	Ch. Alc. Insanity.....	...	24	+	+	...	...	+	+
4	Epilepsy.....	12-52	45	+	+	...	...	...	...
4	Manic-depressive Ins.....	11-49	22	+	+	...	...	...	...
9	Dementia Precox.....	14-200	67	67	40	...	...	3	...
1	Involution Melancholia.....	(Bloody)	356	9	2	...	...	86	...
1	Cerebral Lues.....	...	49	74	25	...	...	...	...
1	Neuresthenia.....	...	6	+	...	...	...	...	...
1	Organic Dementia (?).....	...	120	31	5	1 (7)	...	64 (Bloody)	...
1	General Paralysis (?).....	...	80	37	30	...	...	30 (Bloody)	...

SUMMARY OF CELL COUNTS, POST-MORTEM FLUIDS.

No. of Fluids	Diagnosis	Cells in 100 fields, (Variation)	Cells in 100 fields, Average	Lymphocytes %	Endothelial cells %	Plasma cells %	Phagocytes %	Polymorphonuclear %	Unclassified %	Körner cells %
12	General Paralysis.....	500-9400	1660	62	24	5	3 (9 cases)	1 (7 cases)	5 (6 cases)	...
8	Organic Dementia.....	320-2157	1000	19	68	2 cells 7 in 2 cases	8 cells { 3 cases	1 (4 cases)	6 (7 cases)	10% { in 1 case
3	Senile Dementia.....	340-800	430	26	63	2 cases	...	...	10	...
1	Manic-Depressive Ins.....	...	960	23	75	1	...	...	1	...
1	Chronic Alc. Ins.....	...	86	60	32	...	...	3	6	...
1	Dementia Precox.....	...	8	+	+	...	...	...	...	...
1	Paranoia (?).....	...	181	54	41	...	...	...	...	...
1	Paralysis Agitans.....	...	800	10	49	...	...	32 (Bloody)	5	...
2	Idiot-Paraplegia.....	64-520	222	6	90	...	...	10	9	1 in 1 case
1	Morphinism.....	...	100	44	46	...	...	...	...	...
1	Toxic Delirium.....	...	54	29	39	...	...	...	32	...
1	Organic Dementia (?).....	(No autopsy)	45	+	+	...	...	+	+	...
1	General Paralysis (?).....	(No autopsy)	556	66	30	0	4	...	...	...

NOTE: It will be seen that there is a large increase in the total count of cells post-mortem in the majority of psychoses.

A high cell count, with excess of lymphocytes, over 100 to 100 fields, the presence of plasma cells and perhaps phagocytes in a case of suspected general paralysis is the strongest evidence in favor of this diagnosis.

5. It is possible that other organic cerebral conditions may show a cell picture of diagnostic importance, as indicated by the finding of fatty-granule cells in these conditions post mortem.

6. The origin of the cells in the fluid is without doubt in large measure if not entirely traced to the pia mater.

DISCUSSION.

Dr. Fuller said he felt that the very interesting paper which had been presented before the society at this meeting was a distinct contribution to our knowledge of the cytology of the cerebro-spinal fluid. He had not seen any illustrations which so clearly demonstrated the differences in the cellular elements of the fluid as those which Drs. Cotton and Ayer had exhibited, and the accompanying chart was also illuminating. Continuing, he said, any one who has followed the literature of cyto-diagnosis up to this time could not easily escape the conviction that, perhaps, after all, a mere lymphocytosis of the cerebro-spinal fluid was not a very important diagnostic sign of general paralysis. For, aside from syphilitic conditions in which an increase of lymphocytes can generally be demonstrated, cases presenting all of the clinical symptoms of general paralysis have been reported and yet after repeated puncture gave negative results, so far as lymphocytes were concerned. Then, too, E. Meyer, in a paper published not long since (*Archiv. f. Psych.*, Bd. XLII, H. 3), reports a case of recent syphilis and other cases in which the syphilitic infection had taken place some years previously, but which showed no lymphocytosis. Moreover, lymphocytosis has been reported in the cerebro-spinal fluid of persons suffering from mental disturbances other than those cited, even as this study of Drs. Cotton and Ayer has shown.

The explanation previously advanced that a lymphocytosis of the cerebro-spinal fluid was to be looked upon as an expression of meningeal involvement does not seem tenable in the light of the results reported to-day. Alzheimer had already objected to

the meningitic theory in his discussion of Fischer's paper at the 1906 meeting of the *Deutscher Verein f. Psych.*, on the ground even that without any psychosis, as for example in simple arteriosclerosis, an increase of lymphocytes was often demonstrable. If, as appears from the report of the work to which we have just listened, the plasma cell is a constant constituent of the cellular elements of the cerebro-spinal fluid in general paralysis and is absent with equal constancy in the other psychoses, then indeed we have a valuable diagnostic sign. Of the importance of the plasma cell in the anatomical diagnosis of general paralysis we are all aware and to be able to obtain clinical evidence of its presence would seem a distinct gain. A greater number of cases with syphilitic brain disease studied with reference to the presence or absence of plasma cells would have greatly enhanced the value of the paper on this point, but we can all readily understand that the small number of cases reported in this group is no fault of the observers.

As regards the cells which have been described as phagocytic might it not be possible that they are identical with those cells, heavily laden with coarse yellow granules of a fat-like nature and also phagocytic in character, which are found not infrequently in the adventitia of cortical and pial vessels in general paralysis and other psychoses, but which in consequence of the method of fixation—alcohol and subsequent alcohol-ether, and celloidin imbedding—have had their fat content dissolved? To be sure, a figure of a *Körnchen* cell with fat granules stained by the Scharlach method is also shown, but in the drawing before us fat granules are not so numerous as one sees them in the *Körnchen* cells of tissues which have been cut without previous imbedding and without alcohol fixation.

Dr. C. W. Page thought the writers of the paper were entitled to the thanks of the society. This method of diagnosis, while comparatively simple, is a very important one and is destined to supersede other methods. We should try to devise a technique so clear that the results obtained by different observers could be compared. Dr. Page mentioned the case of a patient in Danvers Insane Hospital which emphasized the practical usefulness of this means of diagnosis. This case was first diagnosed as general

paresis, but the patient's condition improved so much that it was thought a mistake in the diagnosis had been made. Had it not been for a positive evidence obtained by lumbar puncture, this man would have been discharged from the hospital to the care of his brothers and against the wishes of his wife, who had had a great amount of trouble with him and recognized his mental condition.

Dr. I. H. Coriat said that the authors of the paper had demonstrated the great value of the cytological examination of the cerebro-spinal fluid in organic diseases of the central nervous system, an examination which is of equal value with the chemical analyses, especially the test for cholin. The changes in the fluid after death, as compared with the fluids in living subjects, is in harmony with his investigations. He found that lactic acid was liable to appear in the fluid shortly after death, even when there were no convulsions, whereas the reaction of the normal fluid is alkaline. The fat found in the cells is probably derived from the lecithin decomposition, the stearic acid of the lecithin combining with glyceryl to form neutral fat.

The albumens of the cerebro-spinal fluid are of great importance, and, contrary to the opinion of a great many, are present in small amounts in all fluids. But the nucleo-proteid is absent in normal fluids, and present in degenerated conditions of the nervous systems, particularly in general paralysis, and is probably derived from the disintegration of the Nissl bodies which are composed of nucleo-proteid.

Dr. Cotton, in closing, stated that tests for albumin had been made in all fluids, according to the methods described, *i. e.*, precipitating serum globulin with either magnesium sulphate, or ammonium sulphate, and boiling the filtrate. But it was soon evident that albumen was not limited to general paralysis, but occurred in the majority of other psychoses, so that the presence of albumen could not be relied upon as a diagnostic factor. It was found that albumen was much increased in some cases of general paralysis, but not in all. The conclusion reached was that either more accurate tests should be used, or that we must modify our ideas as to the presence of albumen in general paralysis alone. He was inclined to believe Dr. Coriat, that the nucleo-proteid was of more diagnostic value.

Correspondence.

THYROIDECTOMY AND INSANITY.

THE SHEPPARD AND ENOCH PRATT HOSPITAL,
January 15, 1908.

DR. HENRY J. BERKLEY, Baltimore.

My dear Doctor.—Some seven or eight months ago, I had a conversation with you concerning a surgical procedure you were contemplating in certain cases of dementia præcox, particularly of the catatonic type. Again, on Thursday afternoon, December 19, 1907, we had some further conversation on the subject, and you narrated to me briefly the histories of four or five patients upon whom operations had been done at the City Detention Hospital, Baltimore, the operation being a removal of a part of the thyroid gland.

I was much interested in what you had outlined in our first conversation, and particularly interested in the results which had apparently followed the operations already undertaken. I asked you at our last conversation, as you will recall, for a report of the cases when you were ready to publish your conclusions, and the theory upon which the operations were based, for the *AMERICAN JOURNAL OF INSANITY*.

I understood at the time that you were not ready to make any public announcement, believing that the cases operated upon were too few, and the time which had elapsed since the operation was too short, to warrant such publication. You may, therefore, imagine my surprise to read in the *Baltimore News*, issued on the day of our last conversation, December 19, 1907, what was purported to be an interview with the Resident Physician at the City Detention Hospital, which, without other evidence, would lead one to infer that this physician had, after study and observation at home and abroad, devised and made the operations performed at the Detention Hospital, of which you had told me, and which were all made, you informed me, by Dr. Follis.

The interview in the *Baltimore News* was, in substance, sent out by the agent of the Associated Press, and has appeared in many newspapers, both in this country and abroad. Worded as it was, it was calculated to awaken wide interest among those who had insane relatives, and to attract more or less attention from those interested in the treatment of insanity. I have had several letters from physicians, asking about the "new operation for insanity," and numerous inquiries have been made by anxious friends as to its real value. All of the letters from medical men have shown a degree of skepticism concerning the matter, as the writers doubted the reliability of newspaper articles upon medical topics. The friends of the patients, however, cannot distinguish between the false and the genuine, and when some one cries lo here, lo there is the remedy you seek for your unfortunate relative, are prone, and naturally so, to follow any suggestion, no matter from what source, and especially one which bears the evidence of personally expressed views upon the part of a physician who was presumed to speak with authority, and who has not seen fit since, so far as I can learn, to make any modification of the statements contained in the alleged interview.

I think, therefore, that you owe it to yourself (although I know you are not one who is jealous of his claims to priority), to the surgeon, who, at your request, made the operations, to your professional brethren who wish to know the real status of the case, but are willing to await your own time for detailed information, and to the public, which is anxiously seeking for whatever glimmer of hope there may be, and which should not be misled into expectations which may be doomed to disappointment, to publish a brief statement of what has been done at the City Detention Hospital, with what purpose, and by whom. Such a statement accompanied with the injunction to the profession and to the public, to await further experience and observation, and mature judgment, will serve to prevent rash undertakings, and possibly, bitter disappointment.

In case you agree with my view, I shall be glad to publish this letter and your reply in the *AMERICAN JOURNAL OF INSANITY*.

I am, very sincerely your friend,

EDWARD N. BRUSH.

BALTIMORE, January 20, 1908.

DR. EDWARD N. BRUSH, Sheppard and Enoch Pratt Hospital.

Dear Doctor Brush.—I am in receipt of your letter of the 15th instant, and in reply think it is best to make a plain statement of the entire matter, so that not only the profession may be informed as to what has actually been done, but also the laity may know that a panacea for all forms of adolescent mental trouble is not offered, in fact, that good results may be expected from only a few well chosen cases.

The writer for more than eighteen months has been seeking a remedy for the distressing malady, catatonia, one of the forms of dementia præcox. The number of cures were so few, and the mental fatalities so numerous, that anything that could be done or devised would be an improvement on present conditions. The work was at first only carried on with private patients, and very numerous drugs and animal extracts were tried in vain. At last I found that the feeding of the desiccated thyroid gland in minute doses, alternated with an alcoholic solution of lecithin did give results in early catatonia, and there followed cures in three successive cases, and great improvement in a fourth one.

This treatment, however, did not seem to be of much avail when the patients had advanced far into the stage of mutism, and further investigation had to be made.

In catatonia a number of the motor symptoms are similar to those in Graves' disease, and this fact has undoubtedly suggested the further course of the procedure.

The Resident Physician at the City Detention Hospital, was, at my request, granted a two months' leave of absence to visit the North German Clinics, also to call upon Dr. Bruce, of Edinburgh, in order to find out if anything new in the line of treatment, unknown to us, could be learned. His visit to Europe was not productive of anything new, and after his return it was determined to try a partial thyroidectomy on two cases, to see if anything favorable would result, the passing resemblance to Graves' disease being uppermost in my mind. Dr. Richard H. Follis, the visiting surgeon to the institution, was then consulted in the matter, and together with the resident physician, we carefully examined a number of cases whose physical condition admitted of the strain

of an operation, and who were not too far advanced in the malady; a recovery being deemed impossible after organic changes had begun in the brain cells.

From among these several cases two were selected, and application was made by me to the board of trustees to permit the operation, also the consent of the parents or relatives of the patients was obtained by the resident physician. Toward the end of June, 1907, the two patients were partially thyroidectomized by Dr. Follis, about four-fifths of the right lobe of the gland being removed, the parathyroid glandules being carefully spared.

Both patients recovered their mental integrity, again became useful members of society, and are now attending to their usual avocations. Two more patients were thyroidectomized in November, 1907. Of these one recovered her mentality; the other at first promised to do so, and then relapsed, in part, though, not wholly. A fifth patient was operated on in December. He also recovered his mind, and promises to make a complete recovery.

The one that did not recover was a well advanced case of unusually severe type, with whom the stage of mutism began in April. After admission to the hospital, he lost flesh at a rapid rate, became profoundly emaciated, bronzed, and showed signs of advancing dementia.

At the beginning of the surgical portion of the investigation all the house physicians were enjoined to silence, not that there was anything to conceal, but to avoid any sensational reports, such as are only too frequent in the daily papers, and are often misleading. You may imagine my surprise, not to say disgust, when my attention was called to the highly sensational, as well as inaccurate, article that appeared in the *Baltimore News* on December 19, 1907.

It is by no means sure that we have discovered a cure for catatonia, and I even doubt it greatly. The number of cases operated upon by Dr. Follis is insufficient to base an hypothesis upon, and it would require a much larger number to make sure of even a reasonable foundation.

I should add that the microscopic examinations of the removed portions of the glands by Dr. McCallum, of the Johns Hopkins Hospital, have shown in two instances an abnormal condition, and in the other three a practically normal one.

Nevertheless, in catatonia, it is possible that there is a functional perversion of the secretion of the thyroid gland, also that the operation induces a return to the natural secretion of this ductless body. The partial ablation of the gland may also produce unknown changes in the general metabolism of the entire body, induced, first, by the high leucocytosis that immediately follows the operation, and secondly, through the partial annulling of the thyroid hormone. In all the patients that have had sufficient time to fully recover, both after the thyroidectomy and thyreo-lecithin treatment, a marked change in the general nutrition was super-induced, so that after the lapse of four or five months there has been the enormous gain of from forty to fifty pounds in weight, and this not confined to the adipose tissues, but equally apparent in the muscular structures. None of the individuals operated upon have shown any signs of myxœdema. I remain, with regards,

Very sincerely yours,

HENRY J. BERKLEY,

Senior Visiting Physician City Detention Hospital, Baltimore.

Notes and Comments.

CATATONIA AND THYROIDECTOMY.—Elsewhere in this number of the AMERICAN JOURNAL OF INSANITY will be found letters from Drs. Brush and Berkley relative to some important observations made by the latter as to the effect of a partial thyroidectomy upon several cases of catatonia lately under treatment at the Detention Hospital for the Insane connected with the Bay View (Baltimore) Asylum. Although the premature and misleading exploitation of this mode of treatment in the local newspapers at first, and subsequently through the agency of the Associated Press is much to be regretted, it is apparent, from Dr. Berkley's excellent letter that the whole subject is of extreme interest and importance. The writer, in reply to Dr. Brush's letter of inquiry, details how the operation was thought of and describes the results obtained in the cases which had undergone a partial thyroidectomy. In view of the failure of past methods of treatment and the hopeless degeneration of cases of chronic catatonia he had felt the need of instituting new methods of treatment for early cases of this disease. The efforts of Drs. Berkley and Follis to bring surgery to the relief of these unfortunate patients is most praiseworthy. There seems some analogy between catatonic rigidity and the muscular condition in Graves' Disease, and this fact led them to attempt the first operation to be followed by other similar operations. It is to be hoped that still other similar operations may be made until the exact benefit to be expected from surgical interference may be fully ascertained. No one claims or believes, and Drs. Berkley and Follis least of all, that the work has advanced beyond a tentative stage. Hence, the present publication is but a preliminary statement which may be modified materially by subsequent experience. We know that the ductless glands exercise a powerful, even if unknown, influence upon metabolism and nutrition. Starling's doctrine of hormones or chemical messengers illustrates the interdependence of all parts of the alimentary canal and the influence of the secretion of one organ

upon the activity of another. Thus the acidity of the gastric juice in the partially digested mass which emerges from the pylorus excites a flow of pancreatic juice and the latter in turn stimulates the activity of the liver and the secretion of succus entericus. A section of the nervous supply to the intestinal tract has demonstrated that the interactivity of these various organs does not depend upon the nervous system and shows rather that a chemical element must be absorbed into the blood which by its presence gives rise to the correlated phenomena of intestinal digestion.

These and similar phenomena warn us that, as alienists, we ought not to confine our thoughts and investigations strictly to the study of the nervous system. Problems of nutrition, metabolism, and vital action are equally involved in the study of insanity, and the influence of the secretion of the ductless glands upon the nervous system and the manifestations of mind should not be neglected. The conservative position assumed by Dr. Berkley commends itself to all observers. There is always great danger of harm from half-knowledge and hasty deductions from a scanty collection of facts. Already alienists are being inquired of as to the possibility of thyroidectomy in all sorts of diseases. Is it probably beneficial in spondylitis deformans, writes the friend of one patient; in dementia præcox, inquires another, and in chronic alcoholic insanity, writes a third? Thus far it appears to have been beneficial only in early cases of catatonia and the limitations of the operation, even in this form, need to be much more thoroughly studied before it is widely employed. More observation is required and more operations should be done, but these operations should only be undertaken by competent surgeons and upon cases carefully diagnosed, and which have been, and can be, after operation under careful observation. The present state of our knowledge is not conclusive.

ANNUAL MEETING OF FRENCH ALIENISTS.—The seventeenth annual meeting of *Médecins aliénistes et neurologistes de France et de pays de langue française* was held at Geneva, August 1-6, 1907. This is the second time only that the meeting has been held outside of France. After the usual addresses of welcome and replies, the president, Prof. Prevost, described the work of

himself and his assistants, Drs. Batelli and Samaja, in producing epileptiform convulsions by means of electricity applied to the brain. Following, Dr. Ladame, of Geneva, read a paper on Dr. Gaspard de la Rive, of Geneva, an eminent alienist who lived from 1770 to 1834, and who occupied a foremost place in the care of the insane. In the afternoon, Prof. Gilbert Ballet spoke of medico-legal experts and their responsibility, following which there was a long discussion. Other papers of medico-legal interest were read by Clark Bell, of New York, and by Dr. Paul Archambault, of Tours. These concluding the work of the day, which was followed by a boat ride on Lake Lemman with a dinner.

The next day a visit was paid to the asylum of Bel-Air, at Chêne-Bourg, where a session was held at which seven papers were read. Luncheon tendered by the city council was served at Chêne-Bourg, and the afternoon meeting was held at the University where Dr. Antheaume made his report on the "Periodic Psychoses," and was followed by M. Dupre, who spoke of the influence exerted upon the genius of Schumann and Hugo Wolff by periodic attacks of insanity.

The next morning Prof. Prevost gave a demonstration after which three papers were read, and a visit was then paid to the hydrotherapeutic baths of the Hotel Beau Sejour where luncheon was served.

After this the congress divided into two sections, one on psychiatry, the other on neurology, and separate meetings were held.

A number of dinners, luncheons, and excursions were given in connection with these meetings, and on the fifth, the congress adjourned to Lausanne, where M. Claude made his report upon hysteria, being followed by M. Schnyder on the same subject.

The last day of the congress, August 6, was given over to an excursion to Caux.

The next meeting will be held at Dijon, under the presidency of M. Cullerre, where M. Laignel-Lavastine is expected to report upon the "Mental Troubles due to Abnormal Action of the Internal Secretory Glands; M. Berger, on "Diagnosis and Clinical Forms of Neuralgia"; and M. Charon, on "Care of Abnormal Children."

THE PSYCHIATRIC SITUATION IN ONTARIO.—The first definite step in the organization of the new department of psychiatry in the University of Toronto was taken in November, when it was announced that Doctor C. K. Clarke had been appointed by the board of governors, professor of psychiatry. The further announcement of the appointment of two demonstrators in the same department was also made: Drs. W. K. Ross and J. G. FitzGerald, of Toronto Asylum, being the appointees. The actual significance of this step is considerably greater than may be apparent because it really foreshadows early action on the part of the provincial government in establishing a psychiatric clinic.

From the above it will be seen that psychiatry is coming into its own in Ontario where a fair-minded government has been found willing to deal with affairs in the broadest possible fashion.

THE INQUIRY AT WARD'S ISLAND.—Probably most of our readers learned through the daily press some time since that charges had been made of brutality existing at Manhattan State Hospital, and an inquiry ordered, but the fact that the charges were not sustained has not been given the same prominence. The following editorial from the *New York Evening Sun* of December 26, 1907, is reproduced in this place because it is an unusual thing for a daily paper to give so much space to a collapsed sensation, and also because we are glad to be able to show in this manner that the charges were not sustained.

The official inquiry into the allegations of brutality at the Manhattan State Hospital is now ended, and though the report has not been published, the commissioners in lunacy intimate clearly that the charges against the attendants were not confirmed. This is fortunately the result in the great majority of similar investigations after the charges have been carefully examined.

The frequency with which accusations of cruelty are brought against attendants in hospitals for the insane is apt to make a great impression upon the public mind, and the acquittals which usually follow a trial are almost always greeted by some hostile critics with cries of "whitewash." A very little reflection, however, will convince any one of the common understanding that complaints of this sort must always be of frequent occurrence in any asylum. Setting aside the considerable number of patients in every large asylum who suffer from delusions of persecution and are always making most monstrous, and often the most ridiculous and impossible, accusations against their neighbors—setting them aside, it must be remembered

that among the insane there are many who are violent and dangerous and that with the best will in the world it is not always possible to deal with them tenderly either for their own safety or for the safety of those about them.

When such a patient in a maniacal outbreak puts on the strength of two or three ordinary men and is bent upon destruction it is sufficiently clear that a certain degree of force is necessary to restrain him. Nor is it at all doubtful that on such occasions his own violence, together with the efforts of those whose duty it is to hinder him from harming himself or others, must sometimes result in bruises, nor can any one who knows the difficulty of controlling these cases wonder at an occasional injury.

There are, however, other accidents to be considered. Now and again we hear of broken bones, contusions, and what not, unaccounted for and consequently attributed by popular consent to unnecessary violence in the wards. Now it is well known that certain trophic disturbance in the insane gives rise to marks very nearly resembling bruises; but apart altogether from these phenomena there are the bruises so often inflicted by the patients themselves and frequently unnoticed at the time. In advanced cases of general paralysis bruises sometimes appear on the least provocation—even the slightest pressure may be sufficient—the bones are brittle and fractures or other injuries may occur without attracting the attention even of the patient himself, who is often more or less insensible to pain. All of these things must be borne in mind when we hear of circumstantial evidence of "beating" and other forcible discipline in hospitals for the insane.

Finally, allowance must be made for the misunderstanding of inexpert observers. It appears on this occasion objection was made to the continuous bath as a barbarous and inhuman method of treatment. The full report of the investigation not having been published, we are ignorant of the precise grounds upon which it was criticised, but certainly the majority of psychiatrists are in agreement about the value of the bath as a hypnotic or sedative in the treatment of disturbed cases. Even in hospitals where restraint of any sort is frowned upon hydrotherapeutics are regularly resorted to, and it does not appear that the men in authority at the Manhattan State Hospital were accused of resorting to any extraordinary measures.

It is well that the commissioners should call attention to the position of the attendants and the nurses in the State hospitals. Their duties are important, and in consideration of their responsibility they are surely not overpaid.

THIRD MEETING OF BELGIAN NEUROLOGISTS AND PSYCHIATRISTS.—This meeting was held at Antwerp, September 27, 28, and 29, 1907. The last day was given over to social diversion, no papers being read that day. Interest was especially shown in the

reports by Dr. Debray on *La déviation conjuguée des yeux*, by Dr. Crocq on *La situation du médecin d'asile en Belgique*, and by Dr. Hollander on *L'apraxie*. The sessions were well attended, and the meeting seems to have been quite as successful as those previously held.

DEATH OF DR. ORDRONAU. —It is with a sense of personal loss that we record the death of Dr. John Ordronaux, which occurred on January 20, at his residence, Glen Head, L. I., from apoplexy. Dr. Ordronaux was born August 3, 1830, received his A. B. from Dartmouth in 1850, graduated in law from Harvard in 1852, and in medicine from the Columbia University, National Medical College, in 1859. He was probably best known to our readers as the first commissioner in lunacy of the State of New York, having held that office from 1872 to 1882, and as the author of papers upon medical jurisprudence.

A more extended notice of his life and work will appear in a future issue of the JOURNAL.

Book Reviews.

Publications of Cornell University Medical College. Studies from the Department of Neurology. Vol. II. (New York City: 1907.)

Like the first volume this is made from reprints of articles by Drs. C. L. Dana, J. Ramsay Hunt, M. G. Schlapp, and A. S. Levery, who are connected with the department of neurology of Cornell Medical College.

As an introduction, Dr. Dana has written a brief account of the manner in which instruction is carried on in his department, to which Dr. Levery adds a summary of the cases which have been treated in the dispensary during the last six years, and a description of the method of filing histories. It is interesting to note that 644 psychoses of mild or early type were treated, including 207 cases of alcoholism, 90 of paresis, 96 of dementia præcox, 35 of manias and melancholias, and 14 of senile psychoses. The average number of mental cases per year is thus 107, which is a sufficiently large number for teaching purposes.

The papers are all of considerable interest and of great merit. Two papers by Dr. Hunt on herpetic inflammations of the geniculate ganglion are of special interest to neurologists, while Dr. Dana's papers on parapilepsy and psycholepsy, and on "The Limitation of the Term Hysteria" contain much that is of value to psychiatrists.

All will welcome this convenient collection of papers from the above writers.

W. R. D.

Functional Nervous Disorders in Childhood. By Leonard G. Guthrie, M. A., M. D., F. R. C. P., etc. Oxford Medical Publications: London, Herbert Froude, and Hodder & Stoughton. (New York, Oxford University Press, 1907.)

In many respects this is the best book that has been written on the functional nervous disorders in childhood, and it is to be hoped that it may have a large sale. Every general practitioner should read it, for few of them understand the subject and recognize its importance. There is so much good sense in this volume, and so much that would be of value to parents, that Dr. Guthrie ought to be induced to remould it in small form for the use of mothers, fathers, and school teachers. In his preface the author states "I may at once disclaim all pretensions to scientific treatment of my subject. The lectures were not didactic when delivered, nor are they *ex cathedra* now; they were intended to promote discussion and to excite interest in the medical aspect of the twentieth century neurotic child." This these lectures will certainly do, and if the author's treatment

is not scientific in the narrow sense of the word, it is all the more valuable from his broad views, which are sound and generous, and from his ability in setting forth clearly the case of the poor neurotic child.

R. N.

Physicians' Visiting List for 1908. (Philadelphia: P. Blakiston's Son & Co.)

This list presents its usual attractive form and is as conveniently arranged. It seems to us to be one of the most satisfactory lists that are on the market.

W. R. D.

Anatomy of the Brain and Spinal Cord with Special Reference to Mechanism and Function. For Students and Practitioners. By Harris E. Santee, M. D., Ph. D., Professor of Anatomy in the College of Physicians and Surgeons, Medical Department, University of Illinois; Professor of Anatomy in Jenner Medical College, Chicago; Member of Association of American Anatomists. Fourth edition. Revised and enlarged. (Philadelphia: P. Blakiston's Son & Co., 1907.)

The following quotation from the preface gives the author's plan of the work: "Being designed for a text-book, the subject matter is presented in the order found convenient to the dissector. The description proceeds from the gross structures to the constituent neurones in each successive region. Wherever the embryology will assist the student to comprehend the adult forms, the development is briefly given in the text; but a special chapter is also devoted to embryology, which presents a concise and connected statement of the development of the entire brain and spinal cord. The special objects held in view throughout the book are the location of functional centers and the tracing of their afferent, associative and efferent connections. Particular emphasis is laid upon the origin, course, termination, and function of conduction paths as they are met in the regular study, and the more important and better known of these paths are summed up in a final chapter on the tracing of impulses. Function is everywhere correlated with structure; and so far as present knowledge permits, the function of each group of neurones is given in connection with its anatomical description."

It can easily be conceived that a work which carries out the plans which are outlined above will give the student a clear and thorough idea of the structure and functions of the nervous system. In every branch of medicine it is becoming more important that a knowledge of the nervous system is essential to a proper understanding of the human body, and this work seems to us to be up to date and to be written in a clear and simple style so that one is not bothered in reading with untangling involved sentences. Then, too, instead of arbitrarily learning a structure we have associated with it its function so that the knowledge may be retained in memory

more easily. All can appreciate this who have had to make these associations themselves.

The book contains 431 pages so that the subject is treated fully and does not resemble a compend. An index of 21 pages seems to fully fill its somewhat important rôle. There are 128 illustrations of which 33 are printed in color, many of these being original, but the majority being copied from other works. While apparently they amply illustrate to the student with his dissection before him, to him who is not so fortunate, a few more would not be amiss. Mechanically the book is well done, but the book is marred by the inclusion of a page of errata, 14 in all, which should not have been overlooked in proofreading.

The book is a most excellent treatise on the anatomy of the brain and spinal cord, and is to be recommended to all seeking for a work on the subject. That it is in the fourth edition argues for its past success, and we are sure that this will continue with the present.

W. R. D.

Third Annual Report of the Henry Phipps Institute for the Study, Treatment and Prevention of Tuberculosis. February 1, 1905, to February 1, 1906. Edited by Joseph Walsh, A. M., M. D. (Philadelphia: Henry Phipps Institute, 1907.)

This report is always a most interesting one and the present volume does not fall behind its predecessors. It comprises 16 separate parts by various members of the staff, many of them upon special medical or pathological subjects. That which is of greatest interest to us is the report of D. J. McCarthy upon the "Neurological Work of the Year," in which besides detailing the results of examination of the central nervous system of 32 cases which came to autopsy there have been recorded the nervous manifestations of 176 cases, of which 65 were in the house and 111 in the dispensary. This comprised a history of nervous diseases in the family, a history of insanity in the family, mental attitude, sleep, dreams, memory, delusions, muscular power, coordination, reflexes, cranial nerves, vasomotor tone, Von Graefe sign, retraction of eyelids, and disturbance of the sympathetic system. This report contains much that is of interest to the alienist, and the parts relative to heredity and to the mental attitude seem to us to be very valuable summaries.

The report contains 404 pages, including the index of 18 pages, and is uniform with previous issues, being well printed and attractively bound in grey paper.

W. R. D.

Abstracts and Extracts.

Die Heredität bei Dementia præcox. VON RYSSIA WOLFSOHN. Allgemeine Zeitschrift für Psychiatrie, Bd. 24, heft 2 and 3, s. 347.

This is a careful statistical study of 647 cases of dementia præcox which were admitted to the Irrenanstalt Burgholzi from the beginning of 1898 until the end of 1905. The total number of cases admitted during this period was 2215, so that the cases of dementia præcox formed about 30 per cent of the total admissions. Ninety per cent of the cases of dementia præcox were found to have nervous or mental diseases, alcoholism, or some other form of heredity in direct or indirect line.

It is impossible in an abstract to give all of the interesting results obtained, but the following conclusions of the author give the gist of the article:

1. About 90 per cent of cases of dementia præcox show hereditary taint in both sexes.
2. Of the four hereditary factors insanity is most frequently (about 64 per cent) met with, followed by nervous diseases, alcoholism, and other forms of hereditary taints.
3. The heredity was combined in about 34 per cent of the cases studied, the most frequent combinations being insanity and alcoholism, and insanity and nervous diseases.
4. A distinct influence of the hereditary taint on the form of the disease cannot be proven when the taint is alcoholism, nervous disease, or other forms of hereditary taint. While by a slight difference the catatonic form is the most and the paranoid the least affected by taint of insanity.
5. The influence of the taint has no striking effect on the issue of the first manifestations of dementia præcox.

W. R. D.

Les Auras Visuelles des Épileptiques. By A. RODIET and F. GAUS. Archives de Neurologie, Vol. II, p. 177, Sept., 1907.

The authors define the aura as the sum of the phenomena at the beginning of the attack. These phenomena are motor, sensory, or intellectual.

The visual phenomena reported by various authors are reviewed, and the authors report six personal observations.

CASE I.—Madame Ga., aged 27 years. The aura which precedes the attack is a voluptuous sensation which the patient feels from the knee to the abdomen. At the same time all is black before her eyes and she loses consciousness.

CASE II.—Mlle. Us., aged 20 years, often has a visual aura consisting of frightful hallucinations very like those of alcoholics in which the patient sees mice and serpents.

CASE III.—Mlle. R. de C., aged 33 years. The patient has fear of the devil which is represented as clothed in red and surrounded by red flames. She does not like red.

CASE IV.—Mlle. Mi. About an hour before the attack she experiences a sensation as if someone had thrown salt or vinegar in her eyes. At the same time there is a whistling in her ears and her head becomes heavy as if sleepy. A few seconds or minutes before the attack there is an impression of icy cold in the eyes and vision is disturbed as if it was dark. There is an impression of twilight and the attack begins with a cry.

CASE V.—Mlle. Ta., age 17 years on admission. Some minutes before the attack she feels a blast of air from the abdomen rising to the head. She then seems to see fire and to avoid this she runs a hundred meters. She then sees behind her some one who resembles God with a little figure in his beard, gentle eyes, and holding a pistol in his hand. She hears something say she will never be cured, and loses consciousness.

CASE VI.—M. Math., aged 35 years. Before the attack he experiences visual impressions so strange that he cannot relate them. He sees something very hard, very painful, very bad, coming toward him, which causes fear, but of which he cannot distinguish either the form or color. Sometimes he strikes his eyes and turns in order to avoid seeing it, and from this moment amnesia is complete.

The authors state that these visions are most frequently frightful and the patients experience great fear. The movements of defense are the cause of the impulsive unconscious acts which render the epileptic dangerous.

RICKSHER.

Further Investigations on the Galvanic Phenomenon and Respiration in Normal and Insane Individuals. By CHARLES RICKSHER and C. G. JUNG. The Journal of Abnormal Psychology, Vol. II, p. 189, Dec., 1907-Jan., 1908.

The experiments described are a continuation of work begun in the Psychiatric Klinik in Zurich to determine the value of the galvanometer and pneumograph in psychological work and especially in abnormal psychology.

For many years it has been known that the emotions caused a change in the electrical resistance of the body. This was first pointed out by Ch. Féré in 1888, and since then various observers have noted it, but no definite systematized work has been done until the present.

In the experiments, both normal and insane, educated and uneducated individuals were used as test persons. In the normal test persons the decrease in resistance caused by various physical and psychical stimuli varies greatly and seemed to vary as to the temperament of the individual

and to the interest taken. By concentrating his attention on some difficult mental problem the individual could disassociate himself and prevent changes in resistance.

The curves obtained by the pneumograph in normal test persons differed from those obtained by other authors and lead to the conclusion that no definite rule could be formulated for the changes in respiration caused by the emotions.

The abnormal test-persons consisted of patients suffering from epilepsy, dementia præcox, general paralysis, chronic alcoholism, alcoholic dementia, and senile dementia. In all diseases in which there was mental deterioration there was a decrease in the changes in electrical resistance caused by the various stimuli. In catatonic stupor and in extreme dementia there was practically no change. In acute alcoholics and in general paralytics in a state of euphoria the changes were greater than in the normal test-persons. In one case just emerging from an attack of delirium tremens the changes produced in the resistance by the various stimuli were very great.

In all cases psychical stimuli cause a less galvanic fluctuation than do physical and this is especially marked in those cases showing intellectual deterioration.

The pneumographic results in the abnormal test-persons were practically those found in normal cases.

That the galvanic fluctuation was caused by the psychical and not the physical factor of a stimulus was shown by the facts that:

The reaction was greatest when the stimulus was such as to call up a great number of associations.

A stimulus causing doubt and perplexity was accompanied by a marked galvanic fluctuation.

In dementia where associations were few the reactions were correspondingly decreased.

The physical intensity of a stimulus bore no regular relation to the size of the galvanic reaction.

The conclusions of the authors were:

1. The galvanic reaction depends on the attention to the stimulus and the ability to associate it with other previous occurrences. This association may be conscious, but is usually subconscious.

2. Physical stimuli as a rule cause greater galvanic fluctuations than do the psychical in our experiments. This may be due to the fact that they occurred before the psychical stimuli, early stimuli nearly always causing greater reactions than do later ones.

3. While the normal reactions vary greatly in different individuals, they are as a rule always greater than pathological reactions.

4. In depression and stupor the galvanic reactions are slight, because attention is poor and associations are inhibited.

5. In alcoholism and in the euphoric stage of general paralysis the reactions are high because of the greater excitability.

6. In dementia the reactions are practically nil because of the lack of associations.

7. The reactions show great individual variations and within certain, rather wide, limits are entirely independent of the original bodily resistance.

The pneumographic results may be summarized as follows:

1. The inspiratory rate varies according to the individual and no general rule can be given.

2. The amplitude of the inspirations is generally decreased during the rise of the galvanic curve.

3. This decrease in the amplitude, however, has no relation to the height of the galvanic curve, but varies according to individuals.

4. In cases of dementia where there is no galvanic reaction the changes in the respirations exist, but are very slight.

RICKSHER.

Ophthalmic Reaction en Psychiatrie. Par Mm. G. RAVIART, médecin en chef, et LORTHOIS, GAYET et CANNAC, internes de l'Asile d'aliénés d'Armentières. L'Echo Médical du Nord, An. II, p. 565, 1 Dec., 1907.

Those who know the difficulties attending the diagnosis of pulmonary tuberculosis in certain of the insane will understand the appreciation which has been given the new method of investigation introduced by Calmette. Also certain forms of mental disturbance are apparently due to tuberculosis, so that any investigation of the subject will naturally be divided into two parts. First, the frequency with which tuberculosis occurs among asylum patients, and especially the relationship to their age, and the length of their residence in the asylum. Second, the relationship to various mental diseases which is of interest from an etiologic viewpoint.

The subjects of the present investigation were 623 adults and 66 children from five to sixteen years, none of whom showed the slightest sign of ocular inflammation. One drop of Calmette's tuberculin solution was dropped into the left eye and some of the patients were observed for eight days. This prolonged observation was made on account of the different reactions found. The reaction occurs so frequently in 24 hours that this duration has been fixed by Calmette, but the reaction may be delayed or prolonged.

Among the 623 adults the reaction was positive in 272, negative in 328, and doubtful in 23. Among the 66 children the reaction was positive in 42, negative in 21, and doubtful in 3. That these figures are so high is doubtless due to the frequency with which pulmonary tuberculosis is met with about Lille and among the insane.

The following table gives the results in patients grouped according to length of residence.

Length of Residence.	Adults.			Children.		
	Positive.	Negative.	Doubtful.	Positive.	Negative.	Doubtful.
From 0 to 1 yr.	36	79	11	4	11	0
" 1 to 5 yrs.	81	101	6	21	6	1
" 5 to 10 "	69	62	4	10	2	1
" 10 to 20 "	59	62	2	7	2	1
More than 20 "	27	24	0	—	—	—

The reaction upon cases of psoriasis, anal fistula, cold abscess, otitis, white swelling of the knee, and sero-fibrinous pleurisy is reported with variable results.

The majority of the positively tuberculous reacted, and of four tuberculous cachectics only one who died 20 hours after the instillation did not react.

Three cases in whom the reaction had been observed came to autopsy and showed no tuberculous lesions, but five others confirmed the reaction.

The reaction in 620 cases grouped according to mental disease is shown by a table and graphically by curves. In paranoia, paresis, alcoholism, and epileptics the reaction was positive in 30 to 35 per cent; in senile dementia, 37 per cent; in imbecility, organic dementia, and débilité mentale, 40 to 45 per cent; in dementia præcox, 60 per cent; in idiocy, 64 per cent, and in secondary dementia (dementia vesanique), 74 per cent. This last group comprising patients who have been insane for a great many years and have been resident in the asylum for a long period.

The question as to the etiologic importance of tuberculosis is not answered, there lacking sufficient proof upon this point. W. R. D.

Gustatory Audition: A Hitherto Undescribed Variety of Synæsthesia. By ARTHUR H. PIERCE. The American Journal of Psychology. July, 1907.

The case reported by the author is that of a young woman about to graduate from college who, as far as she can tell, has had these experiences all her life, but the fact that they were peculiar to herself only came to notice about four years ago. Two sense defects are noted in the subject: (a) she is slightly deaf, and (b) she is anosmic.

A list of words are given with their gustatory equivalents. These equivalents refer to the fact that the subject feels as if she were actually having in the mouth the described substance, or some substance possessing the equality indicated. All the possible qualities of gustatory, cutaneous, and tactual-motor experiences are represented. As examples:

Alice—Spanish cream, with sprinkling of sugar.

Amy—Ketchup (especially vivid).

Amethyst—Bitterness.

Belfast—Juicy beefsteak.

Boy—Gum drops.

Box—Nothing definite.

Cause—Hot, soft corn-bread.

Cox—Sensation of irritation in throat.

Dice—Cool, salty.

Eunice—Intensely sour. Draws the jaws so that there is decided pain.

Lida—Mutton tallow.

Ralph—Moist, cool. Raw cucumbers (vivid).

Sarah—Cold metal between the lips.

Silas—"Si" is indefinite; "las" is candy.

A table of representative words yielding the various sense qualities is as follows:

Sweet: Dolly, Irving, joy, parlor.

Sour: Eunice, Inez, Italy, Josephine.

Salt: Idle, Judith.

Bitter: Amethyst, Browning, Harriet.

Cold: Noise, Sarah, William.

Hot: Cause, discrete.

Pressure: Ethel, Hall.

Pain: Eunice.

Tactual-motor: Ben, Bess, Clara, Kitty, John.

The synæsthesias are often experienced in the ordinary course of listening to conversations, lectures, etc. They vary when the word is pronounced differently. A state of hunger favors the synæsthesia, fatigue impedes it.

Various nonsense syllables, foreign words, and non-vocal sounds also produced the synæsthesia. The question as to whether the synæsthesia is real and not a case of artificial association due to a lively dramatic fancy is answered by saying that the subject is an accurate, careful, and discriminating person, and that the gustatory part of the experience comes quite unsolicited. It is found, not manufactured. The food-equivalent of the gustatory qualities experienced must often be sought for with some diligence before an adequate description of the matter can be given to the questioner. Many of the experiences are given quite definite localizations in the mouth. When in doubt, the subject has a way of slightly pressing the cheek inwards with the fingers until the satisfactory equivalent comes. The erratic nature of the matter, many words and sounds evoking no "tastes" whatever, is like that of the well-known synæsthesias. The subject testifies that the experience has a character intermediate between the reality of sensation and the unreality of fancy, imagined tastes seeming to be in the head rather than in the mouth. The equivalents possess a constancy hardly possible apart from a true synæsthesia. After an interval of six months a number of words were given at random from the original list, with the result that the identical equivalents were described in nearly the same language.

RICKSHER.

Calmette's "Ophthalmal-reaction" for Tuberculosis: A Suggestion of Caution in its Use. By ALEX. NAPIER, M.D., F.F.P.S.G. Glasgow Medical Journal, Vol. LXIX, p. 4, January, 1908.

The author quotes Dr. Maitland Ramsay (Glasgow Medical Journal, Vol. LXVIII, p. 515, December, 1907), who, writing of ocular tuberculosis, states of the ocular reaction that it is "entirely local" and refers to its "freedom from danger"; and Dr. W. MacLennan (British Medical Journal, December 7, 1907, p. 1642), who says that "it produces no constitutional disturbance, and, locally, usually nothing more than a slight ocular discomfort and lachrymation," and "to the eye of the healthy it is bland." Also from an article (Lancet, December 7, 1907, p. 1630) in which it is stated that the new test is harmless.

He believes that the above encomiums must be accepted with some reservation, as in two cases of advanced pulmonary tuberculosis he obtained no reaction after frequent trials and in one case (a small bunch of tubercular glands in the posterior triangle of the neck) the inflammation was "very acute and severe, attended by brawny infiltration of both eyelids, much chemosis, and a copious, stringy, muco-purulent discharge—a condition which had not quite subsided at the end of a fortnight." Another case, a man of 50, suffering from peripheral neuritis, had a few drops of sterile tuberculin solution instilled into the right eye October 21, with no reaction. October 26, one-tenth mgr. of new tuberculin was injected under the skin, with no reaction, either general or ocular. October 29, 1 mgr. of new tuberculin reaction was injected, again without result. November 2, 5 mgr. new tuberculin were injected subcutaneously, and the next day, or 13 days after the instillation into the right eye, this eye, and this eye only was found to be acutely inflamed. Both eyelids were markedly cedematous, there was much swelling of the conjunctiva, and there was copious secretion. Accompanying there was a mild general reaction, marked by slight rise of temperature. Another case, a girl of 17, under treatment for lupus vulgaris, had a few drops of the sterile tuberculin solution instilled into the left eye October 11, this being followed by a slight conjunctivitis. October 23 treatment by new tuberculin hypodermically, which had been suspended, while the lesion was curetted and cauterized, was resumed, a fifth milligram being given, and 1 mgr. on the 26th and 29th, none being followed by any local reaction. On November 1, or 21 days after the instillation into the left eye, 1 mgr. was injected under the skin and was followed in an hour or two by a "sharp conjunctivitis" involving only this eye. On November 5 and 9, and after each subsequent injection the inflammation of the left eye returned.

The author believes that in these two cases there is evidence of a local change which responds to the introduction of a moderate dose of tuberculin into the circulation, and that this change is not evanescent. Whether this local irritability is met with only in the tubercular subject or also in the nontubercular, can only be answered by future experience, but meanwhile those using this test should bear in mind that it is not quite harmless.

W. R. D.

The Tuberculo-ophthalmic Reaction of Calmette. Editorial (signed E. M.) American Journal of Surgery, Vol. XXII, p. 25, January, 1908.

Mention is made of the method of diagnosis introduced by Koch, and its failure of general use because the opinion some have that it is not entirely harmless, and because of the severe effects of a positive reaction. Von Pirquet's method of vaccination is then mentioned, and Wolff-Eisner's proposal to use a 10 per cent solution of tuberculin instilled in the eye. Calmette (*Presse Medicale*, Vol. XV, p. 443, 1907, also *Echo médical du nord*, Vol. XI, p. 327, 1907) first published a definite method of diagnosis, using a 1 per cent solution of tuberculin. This was prepared by precipitating Koch's tuberculin with 90 per cent alcohol, washing, drying and making a 1 per cent watery solution from the powder.

Since the appearance of the above, Comby has published (*Presse Médicale*, November 20, 1907) the results in 300 cases, Cohn (*Berliner Klinische Wochenschrift*, November 25, 1907) in 310 cases, and Boyd (*Scottish Medical Journal*, December 19, 1907), Austin and Greenbaum (*Lancet*, November 23, 1907), Hutchings (*Therapeutic Gazette*, December 15, 1907), and Baldwin (*Journal of the American Medical Association*, December 14, 1907) in lesser numbers. The consensus of opinion seems to be that, while a positive reaction renders a diagnosis highly probable, a negative reaction does not exclude it. Baldwin believes that the 1 per cent solution is too strong and a half or two-thirds per cent solution should be used.

W. R. D.

L'ophtalmo-réaction dans le diagnostic de la tuberculose. Par POULARD, Ophthalmologiste des Hôpitaux. *Progres Médical*, T. XXIII, p. 909, December 28, 1907.

The author first speaks of the general reaction following the subcutaneous injection of Koch's tuberculin, of the reaction following cutaneous application of the same, and finally of the ophtalmo-reaction, giving the technique and describing the reaction in some detail. He points out that the reaction is not observed in certain cases of advanced tuberculosis, but considers this a slight disadvantage as it is not useful in these cases, but especially in the early or local cases. It still remains to be proved that the reaction cannot be obtained in subjects not tuberculous. The dangers to its use are few, but exist. The reaction may be very intense, the conjunctivitis may persist for weeks, or be accompanied by lesions of the cornea. When applied to an eye already tuberculous the condition is aggravated, and it is questionable whether the reaction should be used for the diagnosis of ocular tuberculosis. He gives the following bibliography: Wolff-Eisner. *Soc. de Medicine de Berlin*, Mai 1907.—Calmette. *Compte rendu de l'Acad. des Sciences*, juin, 1907.—Letulle. *Compte rendu de la Soc. de Biol.*, 22 juin 1907.—Comby. *Arch de Med. des Enfants*, No. 10, *Rev. Generale, Soc. Méd. des Hôp.*, juillet 1907.—Dufour. *Soc. Méd. des Hôpitaux*, juin 1907.—Lépine (J.). *Ophtalmo-réaction en psychiatrie. Compte rendu de la Soc. de Biol.*, 27 juin 1907.—Sicard et Descomps, *Soc. Med. des Hôpitaux*, 14 juin 1907.

W. R. D.

Pamphlets Received.

A Medical Career and the Intellectual Life. By Casey A. Wood, Chicago, Ill. Reprinted from Bulletin of the American Academy of Medicine, Vol. VIII, August, 1907.

The Eyes and Eyesight of Birds, with Especial Reference to the Appearance of the Fundus Oculi. Casey A. Wood, M. D., D. C. L., F. Z. S., Lond., Chicago. Reprinted from Ophthalmology, April, 1907.

Peritoneal Tuberculosis. By Parker Syms, M. D., of New York. Reprinted from Annals of Surgery, July, 1907.

Bulletin No. 120, of the Maryland Agricultural Experiment Station, College Park, Md., August, 1907. Sweet Corn Investigations.

Twentieth Report, Iowa Industrial School for Boys for period ending June 30, 1906.

Bulletin of the University of Nebraska College of Medicine, published by the committee of publication, H. Winnett Orr, Lincoln, chairman.

Nineteenth Annual Report of the Superintendent of the State Hospital at Clarinda, Iowa, to the Board of Control of State Institutions for the period ending June 30, 1906.

Annual Report of the Superintendent of the Independence, State Hospital, Iowa, to the Board of Control of State Institutions for the period ending June 30, 1906.

Twenty-fourth Report of the Mount Pleasant State Hospital, and Third Report of the Hospital for Inebriates at Mount Pleasant, Iowa, to the Board of Control of State Institutions for the period ending June 30, 1906.

Forty-third Annual Report of the Superintendent of the Iowa Soldiers' Orphans' Home at Davenport, Iowa, to the Board of Control of State Institutions for the period ending June 30, 1906.

Twenty-seventh Report of the Superintendent of the Iowa School for the Deaf at Council Bluffs to the Board of Control of State Institutions, for the year ending June 30, 1906.

Sixteenth Report of the Superintendent of the Iowa Institution for Feeble-minded Children, at Glenwood, to the Board of Control of State Institutions, for the year ending June 30, 1906.

Report of the Warden of the Penitentiary at Fort Madison, Iowa, to the Board of Control of State Institutions for the period ending June 30, 1906.

The Thirty-fifth Annual Report of the Warden of the Penitentiary at Anamosa, Iowa, to the Board of Control of State Institutions for the period ending June 30, 1906.

Report of the Commandant of the Soldiers' Home at Marshalltown, Iowa, to the Board of Control of State Institutions, for the year ending June 30, 1906.

Annual Report of the Superintendent of the Iowa College for the Blind at Vinton, to the Board of Control of State Institutions, for the year ending June 30, 1906.

Twentieth Biennial Report of Iowa Industrial School for Girls, for the period ending June 30, 1906.

Twelfth Annual Report of the Lanark District Asylum, Hartwood. For 1906-1907.

Cherokee State Hospital and Hospital for Inebriates, Cherokee, Iowa. Third Annual Report ending June 30, 1906.

Annual Report of St. Joseph's German Hospital of Baltimore, for the year 1906.

Ninth Annual Report of the Manhattan State Hospital, East Ward's Island, to the State Commission in Lunacy for the year ending September 30, 1904.

Thirty-seventh Annual Report of the Central State Hospital of Virginia for the Fiscal Year ending September 30, 1907.

Twelfth Biennial Report of the Northern Hospital for the Insane for the Biennial period ending June 30, 1906. Being a part of the Eighth Biennial Report of the State Board of Control.

Annual Report of the Managers of the Western Pennsylvania Hospital. The Department for the Insane at Dixmont. For 1906.

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